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ORIGINAL MEMOIRS.

SUBDURAL INTERPOSITION OF RUBBER TISSUE WITHOUT REMOVAL OF THE GASSERIAN GANGLION IN OPERATIONS FOR TIC DOULOUREUX.¹

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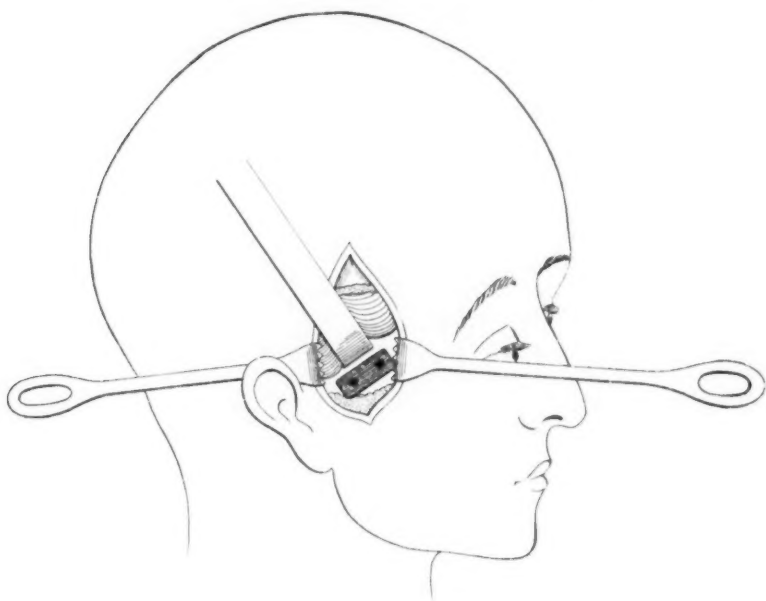
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THE victim of tic douloureux has received the utmost consideration from time immemorial; his sufferings cannot be exaggerated; the maddening repetition of intense pain almost leads to suicide at times. He has usually looked to medical aid in vain, but turning to surgery, a graded scale of more or less successful operations has been offered to him, varying in severity, in promise of ultimate success, and in gravity.

A scrutiny of the methods of past and present shows a decided tendency to attack the deeper parts of the nerve-roots with more freedom and much greater success. In the light of the widest experience, one may say that, to-day, the comments made in the earlier part of the century by Brodie, Velpeau, Stromeyer, and others, of the notorious failure of simple nerve-section in tic douloureux are thoroughly borne out. Later exhaustive resection of the entire second branch of the fifth pair from the foramen rotundum, practised by Carnochan and

¹ Read before the New York Surgical Society, October 8, 1902.

others, has met with much success in relieving pain for short periods of one or two years, in most cases. Extensive resection, also, of the inferior dental has offered a brief respite, usually counted by months. It remains for the elaborate operation of the intracranial resection of Hartley and Krause to give the greatest measure of success with reasonable safety. As the field of operation has gone deeper, we find the risk greater and the technique somewhat more difficult. The question of the



Modified operation with interposed rubber tissue.

removal of the Gasserian ganglion in every case has recently been advocated as the proper course for a surgeon to pursue. This unquestionably adds to the difficulties and dangers of the procedure, and can only be justified by its superior effectiveness. My own experience leads me to oppose this advice. If I needed any better text to justify this discussion of the subject, I would quote a sentence from a recent exhaustive article by Dr. Lexer, assistant at Von Bergmann's Clinic (*Archiv für klinische Chirurgie*, Vol. lxxv, 1902), saying that "Positively good results can only be reached by complete removal of the

ganglion." Appended to his article is a *résumé* of 201 cases from all literature of ten years up to date by Türk. Of these 83 per cent. survived the operation, and 77.6 per cent., or 156 of 201, could be regarded as permanently cured. Of the thirty-three cases of death, seventeen died at the close of operation; eleven died of collapse without regaining consciousness, seven of meningitis, one from infection from without, where the patient tore off the bandages in delirium; two of brain tumor, one of brain abscess, one of softening of the temporal lobe, two cases of postoperative pneumonia, one of heart failure, one of hæmorrhage, one of uræmic coma. Three died without cause of death reported. In two cases at death, brownish softening of the cortex of the temporal lobe was found, and in one of these cedema of the pia mater. Moreover, he says, in other fatal cases temporal lobe injuries were found in addition.

Thus we cannot fail to be impressed with the increased gravity of operation when the Gasserian ganglion is operated on. With the seriousness of this no one who has done the operation can fail to be impressed. The fact of hæmorrhage and the necessarily severe handling of the anterior lobes of the brain during the uncovering of the nerves adds much to the gravity of the procedure. Too great energy on the part of an assistant will crowd the retractor upon the brain with almost crushing force, when we consider the softness of this structure. The varying degree of shock which accompanies the evulsion of the ganglion is always to be feared and guarded against.

The only case of death occurring in my own experience was from the shock of evulsion in a woman of sixty-three, reported among my earlier cases of the Hartley operation in the *Journal of the American Medical Association*, May 5, 1900. Of the seventeen fatal cases of ganglion removal reported above by Lexer and Türk, eleven died from shock.

I have been so impressed with these facts that I have tried to arrive at a safer and equally effective method, which I am prepared to offer with sufficient evidence to make it seem to me worthy of confidence.

Six years ago this month I presented to this Society the first case in which I carried out the following simple procedure. The patient is now again shown in perfect health.

A man of forty-six years had suffered the most violent tic douloureux on the right side of his face for three years. His teeth had been extracted, and two external operations had been done before I saw him, with only brief respite. The spasms were so intolerable that the patient had contemplated ending his life. I tried to expose the nerve-roots by the Hartley intracranial method, but the hæmorrhage was very grave on all sides, and I was obliged to pack the wound with iodoform gauze. On the next day I continued the dissection under ether with great care, but the deep hæmorrhage was too great to permit me to complete the exposure. Again I packed the wound and left it two days more. On removing it I made an excellent exposure of the second and third branches, which I clamped in artery forceps and cut off at their foramina, and by rotation evulsed them from the Gasserian ganglion. Less than one-half inch of nerve was torn out, and the hæmorrhage was so violent again that, in further attempts to dissect away the ganglion, I was forced to desist. Impressed with the probability of the future union of the divided branches, it occurred to me to interpose a small sheet of sterile rubber tissue under the ganglion covering both foramina of exit. This was pressed down upon the bone by iodoform gauze, which was left *in situ* for another day. At the end of the fourth day, without anæsthesia, the gauze was removed; the wound was dry; the tissue was seen lying flat over the foramina; the brain settled down upon it, and the wound was closed with a few stitches. The patient left the hospital in three weeks well, and has never had a twinge of pain since, the rubber tissue presumably remaining as placed.

I then said that this new principle of the interposition of a sheet of rubber tissue as a permanent barrier to the reunion of a divided intracranial nerve might obviate the extensive destruction of the Gasserian ganglion. I have now had five opportunities of proving the truth of this assertion. Since then several operators have advocated more and more extensive

resection of the ganglion until the limit of anatomical dissection has been reached, and, in my opinion, the boundary of safety has been overstepped.

Some important considerations of this subject must be considered here.

- (1) The nature of the disease.
- (2) The question of regeneration of the nerves.
- (3) The value, safety, and durability of the interposed non-conductor.

1. I have been much impressed in many of the anterior resections of the second and third branch which I have done, either where the inferior dental nerve has been exposed in its bony canal without handling, or where the second branch has been dissected from its canal in the roof of the antrum, with the fact that there appears a deep purple congestion of the nerve in parts, while adjacent portions appear white and normal. Microscopically, these dusky portions show an inflamed nerve-sheath. It has seemed to me that, usually, the evidence of nerve inflammation is found entirely anterior to the Gasserian ganglion. The proximity of these exposed nerves in the dental canals and adjacent to the easily infected mucous cavities of the antrum and mouth make it seem probable that the primary neuralgia is due to exposure to infection or cold, and that in these canals the nerve-sheath inflammation is more persistent than in other parts of the body. Pathologically, excepting in cases of bony tumor or disease of the cranial bones like exostosis, I believe the diseases of the nerve will nearly always be located anterior to the Gasserian ganglion.

2. It is of vital importance, in considering this subject, to study the regeneration of nerve-trunks after resection, and in this field we have a most valuable addition in the recent researches of Ballance and Stewart, who have shown that regeneration begins both in the proximal and peripheral ends at the end of a fortnight, both in the myelin sheaths and the neurilemma cells. The invasion of neuroblasts comes from the distal as well as the proximal segment travelling along the line of new vessels invading the intermediate scar-tissue. The new

myelin sheath-cells are seen at the end of two weeks in the proximal end, and a week later in the distal, while at the end of four weeks they are in greater abundance in the distal and in the intermediate scar-tissue, indicating that regeneration takes place more actively in the distal end. The same process precisely has been studied in the regeneration of axis-cylinders. Ballance and Stewart consider they have clearly established that regeneration does not take place by a process of outgrowth from the proximal segment, but is commenced and completed by the activity of cells already existing in the trunk of the nerve. This extreme activity of nerve repair leads one to look for some method of interposing a barrier between these nerve ends. We know that if, during the first few months of active growth, their cell extension can be checked, the firm connective fibrous tissue will soon shrink, and suppress the surrounding vascularity and development of nerve tissue, so that a walled-off fibrous stump must be formed.

3. To consider the question of the material most serviceable for interposition. In 1895, I interposed a circular piece of sterile rubber gutta-percha tissue between the brain surface and dura mater to prevent adhesions recurring which had caused convulsions. Dr. Beach, of Boston, had previously used gold foil for the same purpose; but it seemed to me rubber tissue would be less likely to disintegrate or be perforated in time. My patient was shown to this Society one and one-half years after the tissue implantation, and had remained entirely free from convulsions during that time. Before operation, his convulsions had recurred several times daily, and had continued for a year. The rubber tissue remained quiet upon the patient's brain. Whether it was altered or disintegrated by time, I have no means of knowing. As to its durability, I can only quote another case in which I applied rubber tissue to the brain for similar reasons. The scar was in the forehead, became infected, and the tissue was removed from the sinus months later in a crumpled form, but partly broken up, owing to nature's attempt to expel it through the sinus. This is the only case I know of demonstrating the presence of rubber tissue after a long time.

and it is reasonable to think that where it remains buried in healthy tissue it maintains its integrity. In five cases I have used this interposed rubber tissue after section of the nerve-roots in the intracranial operation for tic douloureux. The results have been perfect, both as to permanence of cure and persistence of the tissue. One case dates more than six years, one five years, one two and one-half years, one one and three-quarters years, and another six months. I would mention one other case in which I did the Salzer operation four and one-half years ago. Anterior to the skull, I laid a piece of rubber tissue with reasonable accuracy over the resected nerve ends in the sphenomaxillary fossa. This case remains well; hence I feel no hesitation in saying the value and safety of the use of this non-conducting medium are now established.

Operation.—I would advocate hereafter, in grave cases of tic douloureux, that the surgeon should not temporize by any of the external methods of operating, but at once resort to this, which now seems to me the proved and radical cure in its safest form. The external carotid artery may be ligated with advantage in controlling hæmorrhage. A vertical incision over the middle of the zygoma carried through the temporal muscle to the bone divides no important nerve or vessels. The muscle is scraped to either side and held by retractors. A small opening is then quickly made by mallet and gouge, and this is enlarged rapidly and safely to an inch and a half diameter. No better exposure can be had by any incision than this simple straight one. The dura is then pressed away from the middle fossa until the nerves are exposed. The much complained of hæmorrhage from venous sinuses on dissecting up the periosteum can be best controlled, and very quickly, by pressing a strip of rubber tissue upon the place with a firm pad of gauze in strips. The clotting of blood under the rubber tissue takes place very quickly, while if plain gauze is put in contact with the bleeding point, the blood being sucked up into it, prevents clotting. The nerve-trunks I grasp in separate artery clamps, divide each close to the foramen of exit, and, either by cutting or by rotation of the forceps, separate them from the Gasserian ganglion.

The wound is packed for a few moments with narrow strips of iodoform gauze until dry. A piece of thin gutta-percha tissue, stiff enough to be easily handled, is sterilized by rubbing with bichloride solution, and kept in salt solution for a few moments before operating. This is cut one and one-half inches long and three-fourths of an inch wide. This is laid carefully over both the foramen rotundum and ovale, where the nerves have been separated and pressed carefully into place by iodoform gauze. In a very few moments the gauze may be drawn away and the Gasserian ganglion allowed to settle down upon the rubber tissue. A small drainage-tube should be placed in the angle of the wound for a few hours to insure a perfectly dry healing.

It certainly is past dispute that there is no need for the removal of the *first* branch of the fifth pair in any case of grave tic douloureux unless the origin is to be found in a tumor of the Gasserian ganglion or behind it.

Conclusions.—I think I have demonstrated (1) that the operations upon the ganglion have been carried to an unnecessary degree of severity; (2) that resection of one-fourth or one-half inch of the nerves anterior to the ganglion and within the cranium, with the interposition of rubber tissue, can be relied upon for perfect cure, up to six years at least, with probability of permanency as great as by any method; (3) that it is a simple, speedy, and safe method, and thereby fulfils the highest aims of the best surgery.

CONSIDERATIONS RELATIVE TO BASEDOW'S DISEASE.¹

THE APPLICATION OF "REGIONARY ANÆSTHESIA" IN ITS SURGICAL TREATMENT.

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HOFFMANN, of Düsseldorf, is authority for the statement that we owe our knowledge of Basedow's disease to von Basedow, a physician of Magdeburg, who described it in 1840, and first drew attention to the three symptoms,—acceleration of the heart, protrusion of the eye, and enlargement of the thyroid gland. There were, however, earlier observers of this symptom complex. Morgagni recognized the disease in 1761, and Parry published an observation in 1786, whilst Graves gave his description in 1835. The disease, on this account, is differently named in different countries. The English call it Graves's disease. In Italy it is called Morbo di Flagani, from Flagani, who also gave an early and exact description. The case of Cæsterreicher's is famous as illustrating the influence of heredity. Of the ten children of a hysterical mother, eight had Basedow's disease, and one daughter had three children who also had Basedow's disease. According to Buschan's statistics, 1894, of 980 cases, 805 occurred in women, 175 in men. Sixty per cent. of the cases occurred after the thirtieth year, but no age was exempt.

Exophthalmic goitre seems to have attracted little attention on the part of American surgeons. In an elaborate monograph upon this subject, published during the past year by Albert Kocher, there appears a bibliography which comprises practically all that has been written in every language. Reference is here made to 1423 contributions. One hundred and nine of these are credited to seventy-four American authors.

¹ Read before the San Francisco County Medical Society.

More than 90 per cent. of the latter are neurologists or practitioners of general medicine. A large proportion of the contributions appeared prior to 1890, before the disease was regarded as within the domain of the surgeon. Literature bearing directly upon the surgical treatment of Basedow's disease is confined almost entirely to German, French, and English authorities.

Basing an opinion upon the work done, and the success achieved by such men as Kocher, father and son, Tuffier, Mikulicz, and many other European authorities, there can be no doubt that partial extirpation of the thyroid gland must be regarded as a thoroughly accredited procedure for the relief of Basedow's disease. A few American surgeons, notably Rixford, of San Francisco, have added much to our knowledge of the general subject.

Etiology.—Under this head, I can do no better than to present in brief the views of Kocher as set forth in the classic monograph above mentioned. This is done chiefly for the purpose of showing the unsatisfactory condition of our knowledge.

Kocher states that Basedow inclined to the belief that the condition depended upon a primary blood change, and regarded the symptom complex as a sequence thereto. He calls attention to the fact that there is no characteristic alteration either in the blood-corpuscles or in the hæmoglobin content; furthermore, while Basedow asserts that there is an antecedent chlorosis, it may be positively stated that this condition is altogether exceptional. He inclines to the belief that in many cases, anæmia, the beginning of puberty, or unusual demands upon the circulatory system, may light up the disease. In this connection he remarks that it is apparent that these influences positively affect the chemistry of the thyroid gland.

Stokes advances the opinion that Basedow's disease usually follows a primary heart lesion; but Kocher discounts this idea, and quotes two cases with compensated mitral insufficiency which were cured by operation without in any way affecting

the heart lesion, showing non-interdependence of the two conditions.

Lempke regards Basedow's disease as an affection of the muscular system. Kocher admits that many of the symptoms appear strongly to support this hypothesis, and quotes Askanzi's statement that there is found in these patients a histological muscle change, the so-called lipomatosis.

Kocher alludes to the position held by Renaut as follows: basing his opinion upon the histological findings of the affected gland, Renaut regards cirrhosis as the typical picture in Basedow's struma, attributing this to a faulty lymph circulation. Kocher himself confirms Müller's statement that in almost all cases of Basedow's disease the lymph glands of the neck are markedly enlarged, and expresses the belief that Renaut's theory seems in a certain sense tenable, but considers the alteration of the lymph circulation rather as a consequence than a cause of the disease.

Charcot advanced the neurosis theory of Basedow's disease, alleging as the cause an alteration of the ganglion cells of the cerebral cortex. This theory is also ably advocated in Germany by Buschan. Combating this theory, Kocher says that the best evidence against it lies in the beneficent influence of operation. On the other hand, the importance of nervous influences must not be overlooked in the small percentage of cases occurring in individuals of a neurotic heredity. Answering Buschan's assertion that the cases cured by operation are not genuine, but pseudo-Basedow cases, and that only the uncured ones are genuine, Kocher refers to his own ninety-one operated cases as sufficient to prove the fallacy of Buschan's assertion.

Kocher's individual belief is that the complicated clinical picture in these cases cannot be satisfactorily explained by the assumption of a definite change in the sympathetic fibres limited to the cervical branches. He thinks it more likely, and in consonance with both the clinical and anatomical findings, that there is an involvement of the entire sympathetic system, including the vasomotor centre.

Unfortunately, the histological studies up to the present time have been incomplete and fragmentary, and we must await the results of more exhaustive analysis before satisfactory conclusions can be drawn. Alluding to the physiologico-chemical researches of the last ten years, he adds, we have as a resultant the accumulation of important and somewhat suggestive data. In the present state of our knowledge, while there is a strong presumptive evidence that certain substances, imperfectly studied, are native to this gland, we can as yet assign to them no definite pathological value.

Hammarsten's observation in this connection is of peculiar interest. From his work on physiological chemistry we obtain the following facts. The chemical constituents of the thyroid gland are little known. Bubnow has isolated a protein substance designated as thyreoprotein; and leucine, xanthine, hypoxanthine, iodothyrene, lactic and succinic acids have been found in extracts of the gland. The amount of iodine in the protein substance has been estimated by R. Hutchinson to be 0.309 per cent. Iodothyrene or thyriodine, according to Baumann, is the only active constituent of the thyroid gland. It is said to produce characteristic poisonous symptoms, is active in myxædema, and its action is similar to that of the gland substance on metabolism and proteid destruction. This is denied by other investigators, and it is generally admitted that no one of the thyroid constituents thus far isolated possesses all the active properties, these latter being the united result of several other bodies.

The foregoing brief *résumé* serves to point out the possibilities of chemical research and to make clear the confusion and uncertainty that now prevail.

Statistical Review.—Rixford refers to a series of 190 operated cases collected by Starr in 1896, showing a mortality of 12 per cent.; and another by Kinnicutt, in the same year, of 187 cases, with a mortality of 7 per cent. It is probable that these comprise in large measure material from similar sources. The same writer has gathered from various clinics sixty-five operated cases with three deaths,—a mortality of 4.6 per cent.

Adding to these, fifty-nine cases reported by Kocher with four deaths, we have 124 cases with seven deaths,—a mortality of 5.6 per cent. It is reasonably certain that with the employment of local anæsthesia, a comparatively recent innovation, a lowered mortality rate will attend the efforts of coming years. From various sources we learn that the subsequent history of operated cases was altogether reassuring.

Of the cases collected by Rixford, fifty-eight were traced, of whom 81 per cent. were cured or greatly improved. Rixford refers to 230 cases collected by Ehrhardt, showing 68 per cent. cured or greatly improved.

In this connection I again take the liberty of quoting freely from Kocher's observations upon his series of fifty-nine cases, 90 per cent. were either cured or markedly improved. Of the fifty-five cases that recovered, thirty-nine, or 75 per cent., had disagreeable postoperative experiences, such as excitement, oppression, palpitation, paræsthetic heat sensations, tremors, diaphoresis, icterus, irregular and frequent pulse. These symptoms are said to have been often more harassing than before operation, though in sixteen cases they were absent. It is Kocher's belief that this exacerbation of Basedow's symptoms is due to the absorption of the gland secretion set free during the operation, which causes specific thyroid intoxication.

To the foregoing I may add three cases operated by Rixford and four by myself—seven in all—without a death; and the present status may be expressed as six cured and one greatly relieved (the latter the last of my own series).

Surgical Treatment.—Argument as to the legitimacy of surgical therapy in Basedow's disease is unnecessary. The transitory relief attending protracted efforts at medical and electrical treatment is generally admitted. It is a matter of surprise that competent observers should at this time persist in efforts that are altogether unsatisfactory and disheartening, advising radical measures only as a last resort. Kocher insists that all cases of Basedow's disease, and particularly those in the incipient stage, should be operated.

The argument for early operation in malignant disease

applies here with equal force. Extirpation, the only rational treatment, should be undertaken before destructive tissue changes have occurred, before the function of important organs has been seriously, perhaps permanently, impaired, and the patient's vitality lowered by chronic thyroid intoxication.

For obvious reasons, complete bilateral extirpation should never be attempted. A small fragment of the least affected lobe contiguous to the tumor can be isolated and left *in situ*.

Advanced cases requiring interference with both lobes should be undertaken in two steps, with an interval of from two to four weeks between operations.

The point made by Dr. Joseph A. Blake, of New York, that excision is better than enucleation in these cases, undoubtedly has merit. The former procedure is readily accomplished without hæmorrhage by applying double ligatures to vessels as they are exposed and dividing between. The latter procedure is inevitable when a lobe is to be divided, and in a few instances hæmorrhage from the parenchyma of the gland will exercise to a high degree the ingenuity of the operator.

In reviewing the detailed histories of a considerable number of cases resulting fatally within a short time after the operation, we cannot escape the conviction that general anæsthesia is, in a very large proportion of them, seriously at fault. There is no difference of opinion among operators as to the impropriety of general anæsthesia in this relation, and especially in advanced cases.

The facility and thoroughness with which local anæsthesia can be accomplished is almost universally recognized. Cocaine, or one of its analogous compounds, has supplanted chloroform and ether, and their great value is manifest in this over all other applications of these drugs.

Up to a recent date the exhibition of these agents has been by the ordinary hypodermic or Schleich method.

A few months ago, in an interview with Dr. J. Marshall Flint, Professor of Anatomy in the State University, he made the very pertinent suggestion that nerve-trunk cocaineization, after the plan evolved by Professor Halsted and successfully

employed by Harvey Cushing in herniotomies, was practicable in this undertaking, and advised so dealing with the superficial cervical nerve. So far as I can learn, the employment of what Cushing terms "regionary anæsthesia" in three of the operations herewith reported is the first application of Halsted's idea to this undertaking. Although it was supplemented by a small amount of Schleich's solution, there is no doubt that the method can be relied upon independently in the average case. A somewhat elaborate statement as to the distribution of the nerve-trunk mentioned will be of interest.

This was kindly prepared for me by Professor Flint, and is given almost in his exact words.

Distribution of the Superficial Cervical Nerve. (*Nervus Cutaneus Colli.*)—The superficial cervical is one of the branches constituting the plexus cervicalis superficialis, which according to most anatomists consists of five main nerves. The superficial cervical branch has its origin from the second and third cervical nerves, and after passing lateralward behind the sternocleidomastoid it turns sharply and passes around the posterior border of that muscle and then runs forward to supply the skin of the anterior triangle of the neck. This occurs at a point corresponding almost exactly with the thyroid cartilage when the body is in a recumbent position, with the head on a level with the back. After passing around the muscle it runs ventralward beneath the platysma myoides and the external jugular vein. The relations which it has with the jugular vary considerably in different subjects, but it usually passes below. Their point of contact is at the level of the junction of the sternal and clavicular portions of the sternocleidomastoid. In most cases it furnishes at this point a small branch which mounts along the jugular vein and anastomoses with the descending branches of the auricularis magnus. It is not known definitely whether these are vasomotor nerves; but Cruveilhier in one subject has followed this branch of the superficial cervical to the skin of the subhyoid region. In the first part of its course the superficial cervical is covered by the superficial fascia and the platysma, while at the anterior border of

the sternocleidomastoid it perforates the fascia and ramifies under the skin in a series of cutaneous branches which are derived from two principal divisions,—the superior and inferior.

1. *Ramus Superior.* This branch is situated just below the hyoid bone and is a continuation of the main trunk of the nerve. It lies between the superficial aponeurosis and the platysma. Its divisions are very delicate, and are distributed throughout the subhyoid region towards the angle of the mandible, where it may pass up over the edge and anastomose with the mandibular branch of the facial. This has been described as the superficial cervical loop or loop of Langer.

2. *Ramus Inferior.* The inferior ramus divides into numerous branches which run along the internal border of the sternocleidomastoid in the subhyoid region and radiate towards the median line of the neck. The inferior branch sometimes anastomoses with the suprasternal branches of the supraclavicular. In some cases the superficial cervical nerves on opposite sides of the neck pass the median line and anastomose with each other.

To expose this nerve, the incision should be made along the posterior border of the sternocleidomastoid about the level of the thyroid cartilage. This may be done under cocaine anesthesia. The area of anesthesia, according to the anatomical distribution, obtained will be triangular, with its apex at this point and its base at the median line. The latter would practically extend from the suprasternal notch to the border of the mandible.

Direct experiment on the cocainization of nerves, however, has shown that the boundaries obtained in this way often vary considerably from those given in text-book descriptions. The reason, of course, is obvious, for many of the finer branches, which convey sensations, are often too delicate to dissect. Moreover, it is now well known that the areas supplied by adjacent cutaneous nerves often overlap.

The cocainization of the nerve-trunk after exposure can be readily effected by the introduction within the nerve-sheath

of two, or at the outside three, minims of a 2 per cent. solution of cocaine through a very delicate hypodermic needle. The duration of anæsthesia is manifest for a period of fully one hour. In the operations reported, I intensified the anæsthesia by the introduction of a small amount of No. 2 Schleich's solution; and in the third case reported below, it was necessary to administer a small amount of chloroform to the point of partial anæsthesia towards the end of the procedure.

CASE I.—M. N., aged twenty-eight years, born in Ireland. Family history unimportant. Was well until five or six years ago, then noticed enlargement over right thyroid. Principal symptom dyspnœa; later there was a recession of symptoms and improvement.

March 28, 1902. Present condition. The right lobe of the thyroid appears enlarged in all directions, its size being fully three times that of the normal gland. There is marked bilateral exophthalmos. For some time past hair has gradually become thinned. Patient complains of inordinate thirst. Is markedly excitable, cries without special occasion. There is marked dyspnœa on slight exertion. Pulse rapid, ranging from 120 to 140. Skin dry. Tremulousness of the tongue when protruded, and of the fingers in extension. Muscular weakness is a marked feature of the case. This is particularly noticeable in the erector spinæ and thigh muscles. When in a stooping or sitting posture, it is impossible for her to assume the standing position without assistance. There is pulsation over right jugulars, and with the stethoscope the characteristic arterial hum is perceptible. Von Graefe's sign absent. Operation advised.

March 30. Ether anæsthesia. Through a vertical lateral incision three and one-half inches long the right lobe of the thyroid was extirpated without difficulty. Pulse during operation was noted every five minutes, as follows: 140, 154, 135, 140, 130, 120, 114, 122, 130, 120, 130, 150, 180 186. Time of operation, one hour and five minutes.

After regaining consciousness the patient became very excitable and wept for some time. Vomiting persistent.

March 31. Condition favorable. Pulse, 130; temperature, normal. Vomiting and restlessness persist.

April 4. Ideal wound healing. Pulse, 100. Appetite good. Digestion perfect. She left the hospital at the end of eighteen days in excellent condition. Exophthalmos still manifest. Muscular weakness less noticeable. Was gaining weight rapidly.

May 2. Reported at office. Looks exceedingly well. Cheeks red. Has gained seven pounds since leaving hospital. Pulse 84 after walking two blocks. Exophthalmos scarcely noticeable. Nerve symptoms greatly improved. Muscular power nearly normal. Muscular tremor absent. The following pathological report was furnished at time of operation by Professor Ophuls.

The gland tissue contains several sharply defined spherical nodules, the largest being the size of a cherry, in which there are cysts with colloid contents. Sections show that the nodules are surrounded by a thin capsule of fibrous tissue.

Diagnosis.—Multiple cystic adenomata of thyroid.

CASE II.—Mr. M. H.; residence, Winnemucca, Nevada; a merchant; aged fifty-six years. Family history unimportant. Has been a tolerably free user of alcohol. About ten years ago noticed enlargement of left lobe of thyroid. For a long time this gave no discomfort, but in the last two years it has increased rapidly.

July 14, 1902. At the present time it appears as a tumor one-half the size of a large orange, extending from the median line laterally, beyond the posterior border of sternocleidomastoid muscle. Its lower margin extends slightly below the sternum. There is slight exophthalmos, with well marked tremor of tongue. Tremor in finger-tips not well developed. Maximum weight ten years ago was 165 pounds; present weight, 156 pounds. Venous pulsation and arterial hum manifest. Dyspnœa. Patient is irritable and easily depressed. Skin dry. Pulse ranges from 100 to 120.

July 15. Operation at Waldeck Sanitarium. Warned by my experience in the previous case, I determined to resort to local anæsthesia. Having exposed the left superficial cervical nerve, I introduced into its sheath two or three minims of a 1 per cent. cocaine solution. I then marked out the line of incision, following the transverse curve of Kocher. Along this line I injected Schleich's solution, and in a few moments proceeded to remove the tumor. This proved to be a large cyst, with a firm, fibrous sac containing from six to eight ounces of thick pulstaceous fluid, liberally impregnated with lime salts. The removal of the sac

was accomplished without special difficulty and with the loss of but little blood.

Time of operation, fifty minutes. Patient complained of only slight pain, and there was practically no shock. Pulse during operation ranged from 110 to 130. Pulse at close of operation, 108. Recovery was rapid, and there was gradual recession of Basedow symptoms. He left the hospital at the end of ten days.

August 11. Reported at office greatly improved in every respect. Pulse 80. Venous pulsation and arterial hum absent. Exophthalmos barely noticeable. Psychic condition greatly improved.

CASE III.—An unmarried woman; residence, San Francisco; aged forty years. Family history unimportant. For about one year has experienced a feeling of fulness about the neck, which is described as a clutching sensation. For the past two months has noticed an enlargement over left lobe of thyroid. At the same time she has become slightly irritable, easily excited, and perceptibly weaker than formerly.

Present condition. Right thyroid enlarged in all directions to double its normal size. Weight normal, 145 pounds. Muscles of face seem drawn, and she presents an anxious appearance. Complexion good. Cries easily. Thirst exaggerated. Appetite capricious, and has little relish for food. Exophthalmos manifest to a slight degree. Muscular tremors well marked. Circulatory symptoms characteristic. Pulse ranges from 100 to 120.

July 17. Operation at Lane Hospital. Local anæsthesia. In searching for the superficial cervical nerve, it was inadvertently divided. A vertical line was then drawn over the tumor four inches long. Beneath this Schleich's solution No. 2 was injected. The incision down to the tumor and partial enucleation of the affected lobe were accomplished under the Schleich anæsthesia, but the patient complained so bitterly of pain that a small amount of chloroform, about one and one-half drachms, was administered, and the enucleation completed.

Time of operation, thirty-five minutes. Pulse-rate during operation from 110 to 130. Tumor consisted of a simple adenoma of the thyroid, and contained a few small colloid cysts. It was closely attached to the trachea, and its removal gave immediate relief to pressure symptoms. Patient made a perfect recovery

and left the hospital fourteen days after the operation. At the end of two months all Basedow symptoms had disappeared.

CASE IV.—Mrs. W. B.; residence, Oakland; aged forty-two years. Father died at fifty-five. Cardiac aneurism, otherwise family history unimportant.

Previous history. Has always been a slender, delicate woman, subjected to great hardships and badly fed. Maximum weight, 120 pounds; present weight, 110. For seven or eight years has noticed bilateral enlargement of thyroid. Right side more prominent than left.

Present condition. Patient is extremely thin and attenuated, pale and anæmic. Complains of exaggerated thirst, polyuria, extreme nervousness, and excitability. Bilateral enlargement of the thyroid to quadruple the normal size. Exophthalmos very marked. Von Graefe's sign well developed. Tremulousness of finger-tips and tongue. Arterial hum, venous pulsation. Pulse ranges from 120 to 140 when at rest. Skin dry. Hair markedly thinned.

August 5. Owing to the impoverished condition of the patient, I determined to remove the right half of the thyroid as a preliminary step, leaving the entire left lobe for subsequent operation if deemed best. Operation at City and County Hospital. Anæsthetic cocainization of right superficial cervical nerve and local cocainization of the skin in line of incision. A small amount of chloroform was administered during latter part of operation, though chloroform anæsthesia was not profound at any time. Pulse during operation ranged from 120 to 130.

Time of operation not noted. There was marked shock and exaggerated excitability subsequent to operation. For several days the pulse-rate was from 120 to 140, and the heart's action somewhat irregular. Wound healing was ideal, and after four or five days the patient's general condition began to improve perceptibly. She left the hospital temporarily twenty-four days after the operation. At that time she had gained weight. Muscular weakness, tremor of the finger-tips and tongue were somewhat modified. The heart's action was feeble and the pulse rapid, ranging from 90 to 100. Exophthalmos about as at time of operation. She returned a few days later, and I advised partial removal of the remaining lobe. This was accomplished on September 9, 1902, by the foregoing method, two-thirds of the lobe being left *in situ*. The anæsthesia was altogether satisfactory.

the patient making but slight complaint of pain. Wound healing perfect. In each instance the gland removed was found to be the seat of cystic adenoma of the thyroid. Since the last operation the patient's condition has improved rapidly. The exophthalmos has receded, although still apparent. She is less excitable. Appetite excellent. All Basedow symptoms greatly modified. Heart's action regular. Pulse-rate, 78 to 80. Arterial hum and venous pulsation have almost disappeared. She is bright, cheerful, and hopeful.

URETER-CATHETERISM: ITS PURPOSES AND PRACTICABILITY.¹

WITH THE PRESENTATION OF A URETER-CYSTOSCOPE FOR MALE AND FEMALE.

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THE purposes of ureter-catheterism in connection with the cystoscope are twofold,—for diagnosis and for treatment.

Diagnosis.—A. To locate the origin of pus, blood, tubercular products or bacilli, the various pyogenic infections, abnormally desquamated epithelium, etc., as to whether they come from (1) the bladder, (2) the right ureter, (3) the left ureter, (4) the right kidney, (5) the left kidney, (6) the right or (7) the left perirenal space, and communicating with the corresponding kidney or ureter.

B. To recognize and locate obstructive conditions in the right or left ureter from (1) stricture, (2) stone, (3) adjacent tumors, (4) bend or kink in the ureter from movable or dislocated kidney, (5) valvular junction of ureter and its pelvis.

C. To determine (1) the presence of two kidneys, (2) if only one, which is absent.

D. To determine the number of ureters present.

E. To determine the functional activity of each kidney separately and relatively, with respect to its excretion of urea, albumen, quantity of urine, the specific gravity, etc.

F. To determine the size and capacity of each kidney pelvis with respect to (1) hydronephrosis, (2) pyonephrosis, (3) total obliteration of kidney-secreting tissue.

G. If there be kidney disease present, to determine (1) if

¹ Read before the Mississippi Valley Medical Association, October 15, 1902.

only one kidney is affected or both; (2) if only one, which is the affected one; (3) if both, which is the one more affected; (4) if removal of the worse one be advisable, is the other one able to carry on kidney function sufficiently? (5) if removal of one be advisable, and the other is capable of supporting life, will the operation remove the infection from the body, removing the possibility of dissemination or recontamination?

Treatment.—A. To enlarge narrowings or stricture at (1) the ureter openings or (2) in the channel of the ureters. By facilitating drainage through the increased ureter-caliber, thus obtained, to assist in the improvement of pyelitis, or pyonephrosis, unilateral or bilateral.

B. To irrigate and medicate (1) the ureters; (2) the kidney pelves of one or both sides.

C. To assist, by anæsthetizing and enlarging the ureter opening, the passage through it of a calculus or a plug of pus, blood, etc.

D. To use the ureter, after it is catheterized, as a guide in certain abdominal and pelvic operations.

E. By prolonged catheterization of a ureter to assist in the cure of ureteral fistula.

To give some indication of the practicability of ureteral catheterism, as well as its clinical advantages, I wish to refer briefly to some of the cases in which I have used it.

CASE I.—*Supposed Ureteral Calculi; Erroneous X-ray Diagnosis.*—G. E. P., male, aged thirty-five years, attorney, consulted me, on the advice of his brother, a practitioner of Chicago, in May, 1902. He said that he had recently experienced some return of symptoms that had been with him some three years ago, frequency of urination, etc., that were finally diagnosed as indicative of stone in the bladder, for which he was operated by the crushing method. This removed the stone but not the inflammation, and during the past three years he has had more or less of the irritative symptoms. I found no organic lesion present, and was giving mild, antiseptic treatment which was doing good, but on a trip to Chicago he was induced to have an X-ray photograph taken of his abdomen, on the suspicion that it might be a return

of the calculous deposit. What was his surprise and horror to be shown the shadows of three stones, evidently lodged in his left ureter, as the photographer explained to him. This was somewhat of a poser to me, when he recounted it to me on his return; nevertheless, as I had failed to notice any indications of the presence of urinary calculus at any point, I refused to be convinced without further evidence. While he thought it useless to make the test, since the stones could be plainly seen in the negative, he acceded to my suggestion of ureteral catheterism. Under cocaine anæsthesia, with my instrument, in about five seconds after entering the bladder I passed a flexible catheter into the left ureter (the one supposed to contain the stones) on up as far as the renal pelvis; not a particle of obstruction nor of scratchy feeling was perceptible, and the urine drained from that side during the next ten minutes was as clear as crystal. There was an immediate and complete disproof of the accuracy of the X-ray finding, and a large degree of relief to the troubled mind of the patient. I later had the satisfaction of an acknowledgment of similar import from the photographer, who thought it must have been "cherry stones," possibly lodged in the colon over the ureter.

CASE II.—*Chronic Unilateral Pyelitis and Cystitis; Pelvic Irrigation*.—A. J. M., male, aged twenty-eight years, street-car conductor, referred by Dr. Y. H. Bond in November, 1901. Following on an incompletely cured attack of gonorrhœa of two years previously, the patient had noted certain pains and dull aches in the bladder and perineal region that were growing and becoming a serious interference with the carrying on of his employment. I gave tonic treatment to his prostate, vesicles, and bladder, the organs which seemed to me to be at fault, attempting to eliminate a bacterial infection of colon bacilli with internal and local antiseptics, and giving periodic massages and hot rectal siphons. This was continued during November, December, and the following January with unsatisfactory results,—only moderate improvement, at best. In February, 1902, more because of the rebelliousness of the condition than anything else, I suggested ureteral catheterism, in order to learn if the infection reached higher than the bladder. On February 25, at my office, under cocaine anæsthesia, I catheterized the right ureter and drained good, clear urine therefrom. On March 26 I again catheterized the same (right) ureter with the same result,—clear, healthy urine. On April 14 I catheterized

the left ureter, and obtained definitely cloudy urine, containing pus and actively motile colon bacilli. Before withdrawing the ureter-catheter, but after removal of the cystoscope, I washed out the kidney pelvis with hot 2 per cent. boric acid solution, repeatedly running it in and out by means of funnel and rubber tubing. On May 7 I again catheterized the left ureter, finding the urine much clearer than on the previous occasion; and the boric irrigation was repeated. The same measures were carried out again on May 14, June 2 and 19, each time showing marked improvement in the urine in its clearness and freedom from infection; and the various symptoms for the first time had been ameliorated to a satisfactory extent. Each time after catheterism the patient went from my office to his work, which he was enabled to resume with energy and ability. He was discharged from further treatment, and has needed nothing of the kind for a number of months.

This was a case of bacterial infection and irritation, not only of the bladder and urethra, but also of the left ureter and pelvis; and as rapidly as the infection of the urethra and bladder was removed, it was just as quickly renewed from the infecting focus above. With this removed by the ureter washing, the whole case was cleared up and relieved. I have noticed in such cases of bacterial infection that one must be vigilant and persistent for some time after the disappearance of the bacteria, as they are prone to recur even after having been cleared up a number of times.

I have had two other cases—one male, the other female—that were the subject of unilateral pyelitis chronica that were markedly improved by similar pelvic washings. I have not yet seen any serious consequences ensue from ureteral catheterism; and I am the more convinced and gratified at this fact since I have had some experience with tuberculous infections of the urinary organs, that *noli me tangere* of this field. If there is anything that may be counted on to do harm to tuberculously inflamed urinary organs it is local instrumentation. And yet the records of the following two cases fail to indicate any harm done, and, on the contrary, recite extremely gratifying results for tuberculous processes.

CASE III.—Mrs. H. S., referred by my friend, Dr. Goodner, of Nashville, Illinois, came in January, 1902; aged twenty-five years. To rehearse the endless symptoms and agonies suffered by the patient afflicted with active tuberculous inflammation of the bladder and other urinary organs is scarcely necessary here; but this poor woman had her share of them. The symptoms began two months after marriage, in 1893. Without any vaginal discharge, she noticed rather rapidly increasing frequency in urination, and, as she expressed it, she could not hold the urine at all in a short time thereafter; there was much sediment in the urine, and often it was quite bloody, or the dripping of pure blood at the end of urination. There was some pain in the back on the left side, passing thence down into the left hip. She lost in weight, and at the time of her arrival in the city she looked cadaverous. The mixed urine taken from the bladder contained both blood and pus, as well as many tubercle bacilli. Cystoscopy with a Nitze instrument proved a failure because of the rapid clouding of the fluid medium; but with my own female cystoscope I not only discerned tuberculous ulcerations in the bladder mucous membrane, but succeeded in catheterizing both ureters successively. The urine from the right side gave pus, blood, and tubercle bacilli in abundance, whereas that from the left side showed only moderate involvement in the inflammatory process, and we could not find any tubercle bacilli in it. Iodoform-oil injections into the bladder were used regularly for a time. There was such decided amelioration in the symptoms and improvement in the general condition, clearing of the urine, etc., that the patient would not listen to any operative procedure, even if I had urged it on her, which I did not, in view of the improvement. If we could have eliminated tuberculous infection of the bladder and the other kidney, the removal of the tuberculous right kidney would have been the procedure of election. But since the bladder was proved to be involved, I deemed it best to try general tonic treatment combined with the iodoform injections mentioned. My last report from the patient is that she has improved much both locally and generally. Her weight has increased considerably.

CASE IV.—*Hæmorrhagic Cystitis and Pylonephritis Bilateralis*.—This case shows the difficulty and uncertainty of diagnosing the source of hæmorrhage from the urinary tract in some cases. I have on a former occasion reported a case of renal hæmorrhage

that gave symptoms and indications that led to the positive but erroneous diagnosis of the vesical neck as the source of origin. F. L. L., aged twenty-eight years, a storekeeper, male, was referred to me by Dr. W. H. Stauffer, of this city, on March 31, 1902. Following after a prolonged attack of acute primary urethral gonorrhœa, there were various heroic measures adopted by the patient's first physician, the final one being a strong irrigation of permanganate of potassium. This set up a severe strangury, excruciating pain both between and during urinations, and the passage of large quantities of blood in the urine, besides fever, chills, etc. On receiving the patient, Dr. Stauffer adopted various soothing treatments, but with only moderate degree of success, and then referred him to me. Because of the depleting agencies present, the patient was extremely weak and anæmic. With each act of urination there was spasmodic straining, severe pain, followed by the squeezing out of blood or clots. Strong sedative measures were instituted, absolute rest, hot applications, but no injections or irrigations into urethra or bladder. While moderate improvement resulted, there was persistence of the bleeding and of certain of the symptoms (strangury, etc.,) and occasional relapses, so that by the middle of April not enough benefit had been attained to justify the continuance of the measures directed on that line, which had included the injection of adrenalin and of gelatin solution, and the internal administration of ergot. Besides, his anæmia was becoming alarming.

Because of the persistence of the bleeding, notwithstanding the freshness and brightness of the blood (which would naturally incline one to think it coming from the bladder only), I began to think that it was coming from a point higher up in the urinary tract. Therefore, under cocaine anæsthesia, I introduced my cystoscope on April 20. Free bleeding from the bladder membrane was clearly evident in the neighborhood of both ureter openings. It was so free that no view could have been obtained by one using a lencystoscope with fluid medium for bladder distention. The fluid would have been clouded almost before the instrument could be introduced, putting an end to the endeavor. With mine, however, and air-distention this made practically no interference, so far as the observation of the bladder was concerned; and when it came to inserting the catheter into the ureter opening, I adopted a manoeuvre that was quite successful in keeping the field clear

of blood while I searched for the opening. That is, I ran the ureter-catheter beyond the end of the cystoscope, down into the base of the bladder where the blood was collecting in a little pool; an assistant kept up continuous aspiration from this pool by pumping on the outer end of the catheter while I was searching for the opening. It was easily found; the catheter was withdrawn sufficiently to bring it in range and run it into the ureter. A small quantity of very bloody fluid was the result, showing that, although bleeding from the bladder membrane had been demonstrated, that was not the only source: it was coming also from the left kidney. And, in order to complete the investigation, I catheterized the right ureter two days later, and drained bloody urine from it, too. Hæmorrhagic cystitis and pyelitis bilateralis, was the more complete diagnosis, then; and the numerous rod-shaped bacilli (colon) appearing in the two ureter urines gave a clew to the cause of the condition: Extension of a mixed infection upward, following a gonorrhœal urethritis, possibly superinduced by injudicious medication.

A surprising sequence of this instrumentation was that instead of its making the patient worse, causing renewed chills, etc., marked improvement began from that day, and he gradually recovered from the severer symptoms, while the bleeding, frequency, and other harassing effects disappeared to a large degree. Now there is occasional tingeing of the urine with blood when he has been too active physically, and he is not yet entirely well, but pelvic inflammations of the kind are not prone to get well in a hurry. I recently began the use of boric irrigations into the renal pelves, and have attained further benefit this way.

CASE V.—*Tuberculosis of the Bladder and Both Kidneys*.—Male patient, aged thirty-six years, referred by Dr. Vernon, of Charleston, Mo., consulted me first in December, 1901. He had had an attack of gonorrhœa sixteen years before, but the present affection was first felt nine years ago. There had been, in addition to the usual irritative symptoms, a large collection of pus in the urine, urinary frequency, and also occasional attacks of pain in the left renal region, simulating renal colic. I catheterized each ureter successively with local anæsthesia and without much inconvenience, notwithstanding the excessive tenderness always present in urinary tuberculosis cases; purulent urine was drawn from each side; and guinea-pig inoculation with each gave posi-

tive results, so that tuberculosis of both kidneys was proved; and through the cystoscope tuberculous ulceration of the vesical membrane was apparent. Iodoform emulsion injections, together with guaiacol and cod-liver oil internally, were used in this case also, and have given considerable improvement both locally and generally. Operative interference in this case is out of the question, of course. That was made evident by the ureteral catheterism. If this procedure were always followed out in such cases, we would not hear of one tuberculous kidney being removed while the other one, even worse affected, is left to do the work of two, fails in the undertaking, and the patient dies long before he otherwise would.

CASE VI.—*Movable Kidneys; Unilateral Pyonephrosis; Operative Fistula.*—Mrs. I. S., housewife, aged twenty-seven years. This case illustrates the necessity of making a complete rather than a partial diagnosis of urinary affections, and the difficulties that may follow neglect in this particular. Married in 1894, the trouble began in 1898, with frequency and pain in urination, and the occasional passage of blood in the urine. A surgeon diagnosed cystitis, and for its relief made an opening through the vesicovaginal septum; that opening has been draining ever since, even to the present day. It did not relieve the distress in frequency, nor the pain in the bladder and both lumbar regions; and when she consulted me in March, 1902, she had practically given up her care of her household. On looking into the bladder I could see the fistulous opening, from which the air of my inflation quickly escaped into the vagina. The bladder wall elsewhere was relatively unaffected. Catheterism of the ureters gave, for the right, clear, healthy urine; for the left, cloudy, purulent urine; and tests of the renal pelvis showed that it possessed considerable capacity,—was able to hold about a half-ounce of boric solution, the explanation of which was learned when I palpated the lumbar regions. While both kidneys were found to be movable (the right one moderately so), the left one hung far down into the abdomen while the patient assumed the erect posture, and easily slipped back into its proper place on her reclining. In falling downward and forward, it had been in the habit of making a kink in the ureter, obstructing the outlet through the ureter, distending the pelvis, and furnishing the "receptive state" for bacterial invasion that resulted in the pyelitis and incited the various symptoms of

which she complained. The indication in this case was, not the making of a urinary fistula, but the anchoring of the two kidneys in their proper place, followed, if it proved to be necessary, by the regular washing of the left renal pelvis. As she had suffered much both from the affection and from previous surgical manipulations,—she had been operated on three times for the closure of the fistula, and without success,—she could not be prevailed upon to undergo another surgical procedure of any kind, and so carries her condition to the present.

CASE VII.—*Pyonephrosis and Perirenal Abscess*.—Male, aged thirty-nine years, had suffered many years from pain in the back and other symptoms of chronic urinary affection. Because of this and of purulent urine present, the Harris segregator was used, giving comparatively clear urine from the right side but cloudy urine from the left. It was considered from this, by the surgeons who made the test, that there was pyelitis present. Later I was asked to make ureter-catheterism. I inserted the catheter into the left ureter, but it would go in only a part of the way; it was withdrawn and reinserted several times before it finally was pushed up about two inches into the ureter. Even then it did not drain immediately; so, after waiting ten minutes or so, I applied aspiration to the outer end of the catheter and by strong pumping got out *one drachm of pure pus*. Instead, then, of there being simply a pyelitis, there was renal abscess with an imperative demand for operative interference. On operating through the left lumbar region, I found the kidney dilated with over a pint of pus, and a stone in the renal pelvis. The segregator could not possibly have attained the results given thus by catheterism and the strong aspiration. The thick pus was not draining from the ureter, and could not have gotten into the segregator from the ureter, and hence could not have gotten into the segregator tube.

These cases present some of the clinical phases of ureteral catheterism. They do not rehearse anything so very remarkable in the way of results in treatment, etc., but they serve to show that ureter-catheterism, in both male and female, has been reduced to a practical procedure that should rapidly become of great service to the profession. It is no longer an idealistic manceuvre that we hear about but never see, but is one that

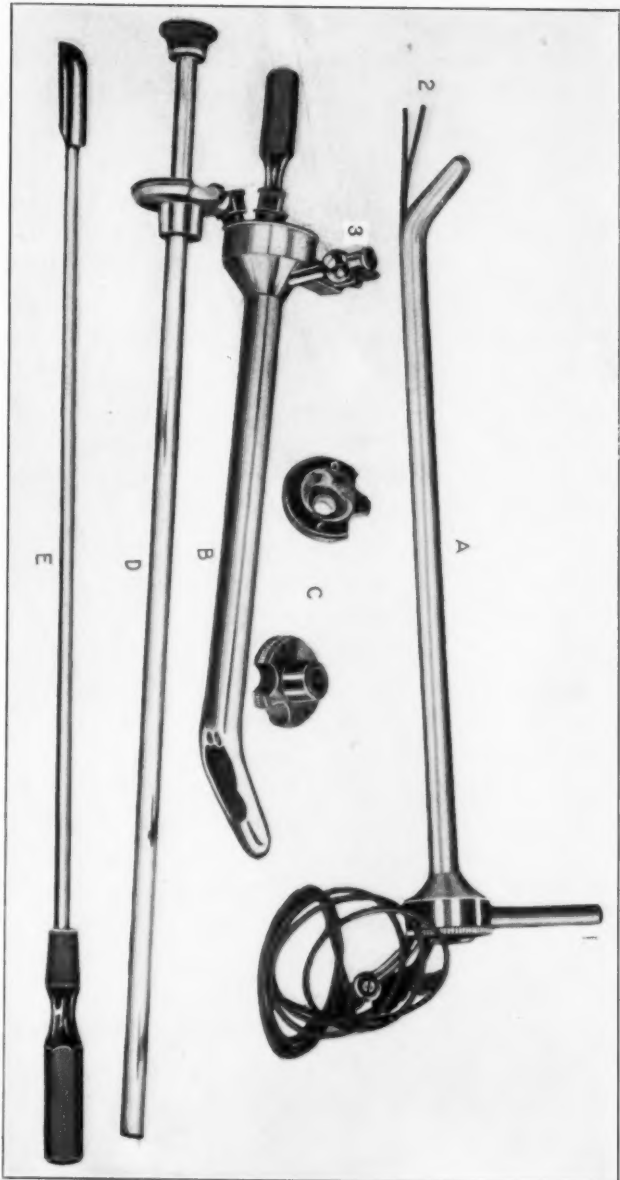


FIG. 1.—A, Male ureter-cystoscope; B, female ureter-cystoscope; C, windows of both; D, periscope or telescope; E, obturator of male instrument. 1, Handle for electric connection; 2, catheters projecting from ureter-tubes; 3, air-tube and cock.

is accomplished every day by those versed in it, and with the highest degree of satisfaction.

While the complicated and costly European instruments have not done much to popularize the procedure, I believe the simpler ones of American make will soon do the missionary work that will enlist the attention of the profession in the practical nature and value of this field.

While most of the ureteral catheterism that I have done has been accomplished with my model containing only one channel for ureter-catheter, my latest model is double-barrelled; so that with two catheters in place, after inserting the lighter colored one into the left ureter and pushing it far enough into the ureter to keep it from pulling out during the further manipulations, the inner end of the cystoscope is turned towards the other ureter, the remaining catheter (a dark one) is inserted into it in a similar manner; the cystoscope is then withdrawn, leaving the two catheters draining synchronously from the two kidneys. This (synchronous ureter drainage) is of great value, not only in the way of affording immediate results and avoiding repetition of the procedure, but also for comparing the secretions of the two kidneys at the same time and under the same general influences. This feature has been elaborately studied by Casper. By it is determined the relative functioning capacity of the two kidneys, etc.

Technique for the Bransford Lewis Ureter-cystoscope.—Extended descriptions of the previous forms of this instrument having already been given (first presentation before the American Association of Genito-Urinary Surgeons, May 1, 1900, *Journal of Cutaneous and Genito-Urinary Diseases*, 1900, page 420), the present form is easily understood (Fig. 1). Its main points are, an ocular tube, a handle, and a beak containing the small cold electric lamp. The electric contact is made at the handle. An obturator assists in the introduction of the instrument into the bladder, after which it is withdrawn and the ocular window is placed in its stead. This window is the only thing that intervenes between the eye and the object, that is, the bladder membrane, when it is undergoing inspection; there

are no lenses, no magnification, no inversion of image, and no fluid to look through or become cloudy and prevent inspection. The lamp is a cold one, so that it cannot burn the membrane even should the two come in contact. The bladder is inflated with air through the stop-cock on one side of the instrument; and there are appended tubes to conduct the flexible silk web ureter-catheters to a point within a half-inch of the lamp, that is, directly to the field of inspection, so that though they are flexible they are under full control of the hand. A late addition to the instrument is a telescope with lenses, that, if one wishes, he can insert through the main (ocular) tube and inspect the membrane with increased field and magnification. Another addition that I think will be more serviceable than this is a telescope with a prism at the inner end, that will enable the operator to "look around the corner," so to speak, especially for the purpose of bringing the hypertrophied prostate or outgrowths from it into view. With this assistance I expect the definite diagnosis of the form of prostatic enlargement to be much simplified.

For the satisfactory use of this instrument, it is necessary to have an operating table that is capable of giving high pelvic elevation, with the legs in flexion, for instance, in stirrups. With the patient placed in this position (excepting the pelvic elevation, which is made after the anæsthetic is applied), the bladder is washed and emptied with a soft rubber catheter. This washing is merely for antiseptic purposes, not for facilitating the work of the cystoscope. One or two cocaine tablets (one and one-eighth grains) are then deposited in the posterior urethra and bladder neck by means of my urethral tablet depositor (2, Fig. 2). The foot of the table is now elevated to an angle of about forty-five degrees; the cystoscope is introduced, the obturator withdrawn, the small quantity of urine that has been collecting since the washing is sucked out through the aspirator (3, Fig. 2), the window applied to the ocular end, and the light turned on. While the operator is looking through the main tube, he gently pumps in some warm air by means of the inflating pump, and watches the walls of the bladder unfold and



FIG. 2.—1, Aluminum swab or applicator; 2, urethral tablet depositor and obturators; 3, aspirator; 4, inflating bulbs with metal extremity for receiving warm air; 5, syringe; 6, funnel with tubing for irrigating kidney pelvises.

expand. A view of the whole interior of the bladder is obtained in panoramic sequence by moving the beak around; and when the ureter openings are looked for they are sought at the upper angles of the trigone. When the little ridge or dimple indicating the location of one is found, the catheter is easily shoved into it, and on up into the ureter. If it is desired to catheterize the other ureter also, the first catheter should be inserted rather far up, to insure against pulling it out in the further manipulations. Then the beak is directed towards the other ureter opening; when it is found, the remaining catheter is pushed into it in the same manner as previously described. The electric cord and the air-pump are disconnected, the air-cock opened, allowing of the escape of air from the bladder, and the cystoscope is removed. Care must be taken in doing this to feed the two catheters into the tubes as the cystoscope is being drawn out, so that when it is removed the catheters are still contained in the ureters, where they may remain and drain the ureters for from ten minutes to a half-hour, according to the amount of urine desired for testing. During this time the patient may lie comfortably on the same table, which has been replaced in a more normal position. If either catheter does not begin draining in a reasonable length of time, gentle aspiration may be made on it by means of the small syringe shown in 5, Fig. 2.

If it is desired to wash out the kidney pelves, that is done after finishing the drainage. A glass funnel with four or five feet of soft rubber tubing attached is filled with hot saturated boric acid solution and connected with the ureter-catheter by a smaller piece of tubing, a piece of glass tubing helping in the transition between sizes, if necessary.

After these several manipulations, irrigations of the bladder should be carried out with some mild, soothing antiseptic, such as warm boric solution.

In the female, examination of the bladder and ureteral catheterism are more easily carried out, both because of the shorter distance to the bladder, and because of the lessened resistance offered the inflow of air. If the clothing of the female is well loosened about the abdomen, on elevating the

pelvis and inserting the cystoscope and removing the obturator the bladder usually balloons out without the necessity of inflating with air. In the male, on the contrary, this is not usually the case, although it does sometimes happen where good anæsthesia is secured.

One of the most troublesome impediments to easy cystoscopy and ureter-catheterism by this method is that offered by the persistently contracting bladder,—a spasmodic condition that is beyond the influence of the patient's will, that holds the bladder walls in a rigid state, resistant to the required movements. This is best overcome by adding to the anæsthesia. Withdraw the cystoscope, drain the bladder of accumulated urine, and deposit one or two more cocaine tablets in the posterior urethra and vesical neck, then reinsert and continue the investigation. While no harm comes from the moderate inflation of the bladder with air, it is a fact that air is slightly more irritating to the membrane than water; but this is especially true of cold air. To obviate this, I am now using warm air, secured by an assistant holding the intake bulb over an alcohol flame during the process of inflation. When the telescope is in use, it is well to pump in the air through one of the ureter-tubes, since the telescope itself occupies the main tube. If at the same time it is desired to remove the balance of the inflowing urine, it may be aspirated through a ureter-catheter passed into the bladder through the other ureter tube. In several of the cases that I have catheterized, I feel positive that, because of the rapidity of accumulating blood, catheterism could not have been accomplished by means of the lens instruments and fluid medium.

I would not advise any one to attempt ureter-catheterism without sufficient equipment to secure, at least, the necessities of the work; and chief among these is a table that will furnish pelvic elevation. This allows the inflowing fluids or blood to gravitate away from the field of search.

I have been much interested in studying the limits to which one may go in putting cocaine into the bladder without causing a toxic effect. While I have on several occasions noted sys-

temic effect from the use of cocaine in the urethra, I do not remember of ever having observed it as a result of absorption from the bladder, although I have often used five or six grains in tablets. In doing litholapaxy in the aged, Dr. Chismore, of San Francisco, habitually injects two or three ounces of 3 per cent. cocaine solution into the bladder; and Dr. Swinburne has mentioned equally satisfactory results from a similar use of cocaine in litholapaxy. I use tablets made in two sizes, one-half grain and one and one-eighth grains. The Rochester Surgical Appliance Company, of Rochester, New York, are the makers of the cystoscope, and I take pleasure in thanking them for the able assistance they have given me in its development, as well as for their accurate workmanship.

ON A POSSIBLE CAUSE OF DIFFICULTY IN THE
DIFFERENTIAL DIAGNOSIS BETWEEN
RENAL CALCULI AND HEPATIC
CALCULI.¹

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It is the aim of this paper to merely show the close relationship that exists between the pelvis of the kidney and upper portion of the ureter on the right side, with the gall-bladder, cystic duct, hepatic duct, and communicating duct of the liver and terminal ducts of the pancreas, with a sometimes similarity of symptoms from a pathologic invasion of any one of them, and more especially from stone formation.

A needle passed through the right lumbar region, piercing the pelvis of the kidney, would pass directly through the descending duodenum at a point where the ductus communis choledochus and pancreatic ducts open (lower third of descending duodenum), then into the transverse colon. The space passed through would be extraperitoneal. There is absolute apposition of the colon, duodenum, and kidney at this point, the supra- and infracolic portion being covered in front by peritoneum derived from the kidney region. A stone after passing through the cystic duct would not be impeded in its movements until it had dropped into the ampulla of Vater, at which point the ostium duodenalis, the most strictured portion of the canal, would have to be dilated, unless collateral biliary circulation should take place through an accessory pancreatic duct, before it would pass into the duodenum. In total occlusion of either the cystic duct or the ureter, the muscular

¹ Read before the Mississippi Valley Medical Association, October, 1902.

action in the gall-bladder and pelvis of the kidney would be the same.

Some one has said that pain in the interscapular region is carried there by way of the phrenic, to the brachial and cervical plexuses, and from there thrown over into the interscapular region,—the region, possibly, of least resistance in the whole body.

A more direct route and through a more likely kind of nerve tissue, it seems to me, would be by way of the splanchnics. The efferent circulation through the greater splanchnic would reach the lower interscapular region (six to ten thoracic; scapula reaches seventh rib) and carried higher by way of connecting filaments (according to Dr. Beck) to the rest of the thoracic ganglia. The lesser and smallest communicate with each other, and also with the greater, so that they together would be able to drain the hepatic and renal region. According to Byron Robinson, the nerves are enormous in number in the peritoneum covering the gall-bladder. He also makes special mention of the profusion of Remak's nerve fibres in the kidney region. The intercommunication around the solar plexus would account for the gastric and intestinal disturbances found. Pain in inguinal, scrotal, or inner crural regions would come from the lumbar plexus, by way of the genitocrural and ilio-inguinal. The scrotal region might also get its pain from the spermatic (sympathetic).

While it is a slight divergence from the subject, yet it is interesting to note that the gall-bladder is an organ that seems to have evolved on account of the body's inability to consume the whole output of bile manufactured. Thereby is reserved a supply for a "rainy day," when the liver is not working. It is as logical to propose a reservoir for the salivary glands or pancreas, in fact, all the secretions that aid digestion, the same stimulation practically is given one as the other during the act of digestion. Then, again, the gall-bladder might be given credit for filling during the stage of stimulation of the liver and pouring out its fluid during the interim. There can be no claim made for actual necessity, however, for one finds

upon investigation that, according to Chauveau, some domesticated animals have no gall-bladder, the horse, for instance; and he rather leans towards the idea that the gall-bladder originated from a dilatation of the cystic duct, on account of the flow from the hepaticocystic duct to the ductus communis. While it is hard to comprehend why an ox should have a gall-bladder and a horse should have none, it is still harder to see how a deer can live without any excretory duct from the liver.

I had an opportunity, personally, to dissect a liver that I removed from a deer last January. There were no ducts to be found leading from the liver.

In the bird (pigeon) the arrangement of the excretory apparatus of the liver differs from the mammals, in that the cystic duct remains independent of the cholic duct by emptying below and behind the duodenal loop.

The kidneys and their excretory ducts are practically the same in the lower animal as in man.

Etiology of Stone Formation.—The proof seems positive that calculus formation in any of the mucous pouches is caused either by a stenosis causing insufficient drainage with a secondary invasion of pathogenic germ organisms, or from a primary bacterial infection (Charcot, Gambault, Ochsner, Niles, and others) and a secondary closure (partial) of the excretory ducts. The concentrated secretion, with a nucleus composed from bacteria and epithelium detritus, forms the stone.

Similarity of Symptoms.—Pain from either hepatic or renal calculi might be referred to almost any point, and would be merely a subjective sign of disturbance in that region. E. Owen, in speaking of the unreliability of pain says, "That the kidney draws its nerve supply blindfolded from the epigastric pool, and that it is small wonder, if in the absence of objective signs, that the patient and surgeon are sometimes led by the subjective symptoms to make serious mistakes." Jacobson explains pain in renal colic as frequently due to the passage of flatus in the colon. In that case the pain producing area would be the thickness of the duodenum, nearer the liver than the kidney.



Fig. 1.—Renal calculus.

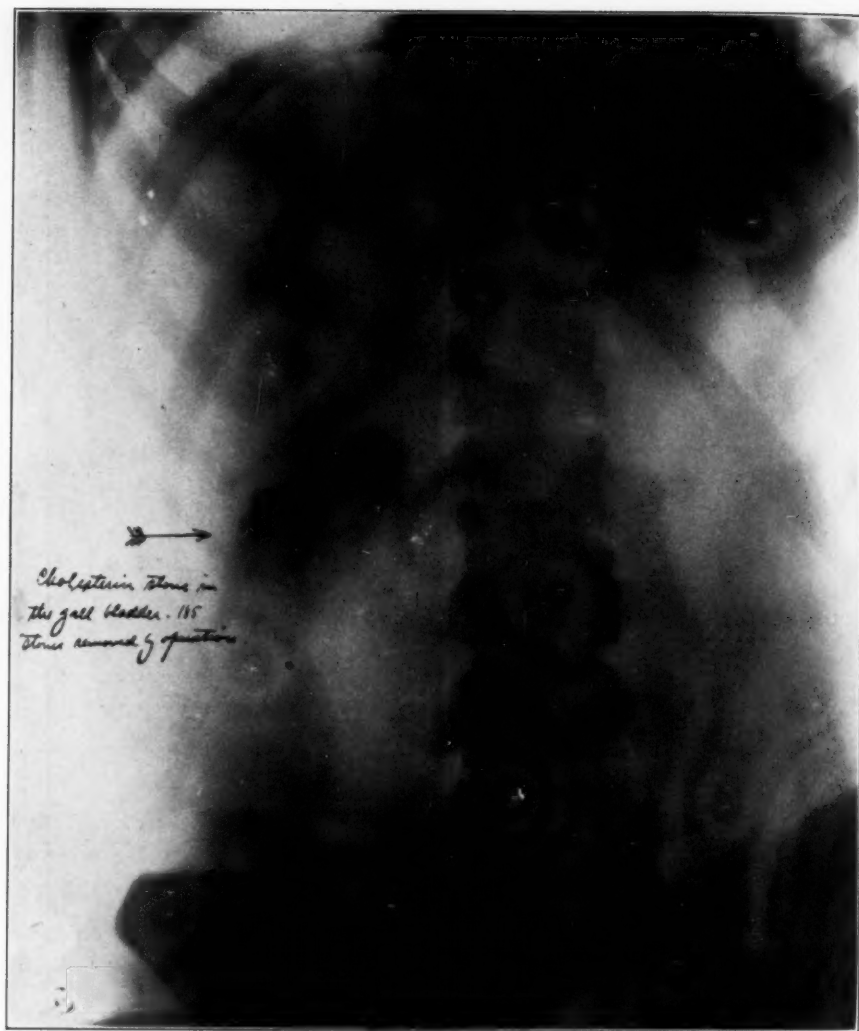


FIG. 2.—Gall-bladder calculus.

Hæmaturia, if present, is considered by some the sign most pathognomonic of renal calculi. Yet here one must differentiate from tubercular nephritis, passive and active congestion, which might be secondary to gall-stone, from granular kidney and sometimes from syphilis. Then, too, it would always be necessary to do a cystoscopy to exclude bladder and urethral bleeding.

Pyuria might result secondary to cholecystitis, cholangitis, duodenitis, colitis, pancreatitis, in fact, from any inflammation within or around about the kidney.

Nausea and vomiting are purely sympathetic symptoms; they can occur in both renal and hepatic calculi, and can also be absent in both.

Appendicitis can simulate both renal and hepatic calculi.

Icterus is a sign not to be depended upon, for it is present frequently outside of stone formation. The most marked case of jaundice I have ever seen occurred in a soldier, during the Spanish-American war, who had an enterocolitis complicated with nephritis; in fact, the major portion of the Northern soldiers were jaundiced on their return from the South.

Urine examinations throw but little light on the subject.

The X-ray in differential diagnosis is not so valuable in this region as elsewhere in the body, and unless stereoscopic skiagraphy can be perfected, sufficient to measure depth, there always will be a question in the mind of the operator. To illustrate this point I have two radiographs, both taken from living subjects,—one a renal stone, the other a hepatic calculi. Both shadows are directly opposite the lumbar vertebra and both shadows show in front of the right transverse process (Figs. 1 and 2).

In a female subject in which I had passed malleable wire sounds into the ductus communis choledochus, pancreatic duct, and the ureter, the radiograph shows the ends of the sounds directly opposite the second lumbar vertebra, leaving a space as large as a half-dollar, which would correspond to the kidney pelvis.

Behind this body, in order to test the density of the shadow

in the different kinds of renal calculi, four artificial renal stones were placed. The first was composed of calcium oxalate (which shows the dimmest); the second, uric acid; the third, triple phosphates (those two show about equal in density of shadow); the fourth was composed of all three combined, its shadow coming second in density. (Fig. 3.)

In another cadaver, also a female, mercury was injected into the gall-bladder, after ligating the terminal ducts, and a wire was passed from the urinary bladder up the ureter into the upper quadrant of the kidney pelvis. The radiograph shows the gall-bladder, from the weight of the mercury, hanging down below and to the right of the second lumbar vertebra. The sound is above and internal to the gall-bladder shadow. This demonstrates two especial facts,—a possible anomalous position of the gall-bladder when weighted down with stones and the near relation of the cystic duct, in this subject at least, with the upper portion of the pelvis of the kidney. (Fig. 4.)

Notwithstanding the advancement that medical science has attained to-day, it is in my opinion impossible, in some cases, to make a differential diagnosis between hepatic and renal calculi. So, in cases of doubt, it seems logical to cut down to the kidney first, and after that one can be governed by the findings he makes.

The following case is an illustration.

Mrs. K.; residence, Fort Wayne; aged forty-nine years; no children; family history good; father lived eighty years, great-grandfather ninety-six, mother still living, one of twelve children, all healthy except oldest brother, who has stomach trouble. Typhoid fever when twenty years of age. Never laced tightly. Disliked milk. Gives history of comparative health from typhoid fever to twelve years ago, at which time she had periodic attacks of colic, referred to the right lumbar region, which occurred about three times a year.

Two years ago I was first called to see her during one of these attacks. The following symptoms describe her succeeding attacks up to the time of operation: Intense pain in right lumbar region, interscapular region, and in right labium. No jaundice,



FIG. 3.—Skiagraph exhibiting shadows of wire sounds in common choledochus duct, pancreatic duct, and the ureter on right side; and of four artificial renal stones on the left side.



FIG. 4.—Skiagraph exhibiting gall-bladder filled with mercury, and ureter occupied by a wire sound.

no tympanites, until the following day; no nausea except that caused from the use of chloroform, which had to be used to control the pain. Examined faecal matter and urine repeatedly for stone without success. Operation advised, with a leaning towards renal rather than hepatic calculi as cause of trouble. Operation, April 9, 1902.

Nephrotomy; delivered kidney on back; needled same. During manipulation felt sac of stones inside peritoneal cavity. Replaced kidney. Closed lumbar wound. Opened abdomen in right rectus region. Delivered gall-bladder after breaking many adhesions. Closed belly up to gall-bladder. Cholecystotomy eight days later. Many stones removed. Seven stones found in stool after first operation. The interscapular pain was especially marked during the irrigations and dressings of the gall-bladder.

SOME POINTS IN LIGATION OF ARTERIES.¹

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I.

WHEN the writer graduated in medicine twenty-one years ago and for a good many years thereafter, it was the practically unanimous teaching of all the standard text-books that, in controlling any artery of importance, it was the surgeon's duty to tie so tightly as to rupture the innermost one, or even two, of the three tunics. He tried to use enough force to feel the divided tunics yield beneath his firm traction; the idea being that in a healthy artery the outer tunic is practically safe to withstand such force; and that the tunica intima and media, when ruptured, contract and retract into the remaining, unbroken tunic, and their curled-up, roughened ends were thought to invite prompt clotting and to safeguard against a secondary hæmorrhage.

The "surgeon's knot" was little advocated, excepting for suturing, at that period of surgical history. It was claimed, as against its use for ligating, that by kinking the double first turn prevented at times a tight enough constriction of the vessels to break the inner tunics.

As a consequence of experimental work from many sources, the present, modern views were evolved. "Ballance and Edmunds upon Arteries," "Senn's Experimental Surgery," and the works of Billroth and Esmarch may especially be mentioned in this regard. To-day nearly all standard text-books and teachers have reversed the rule mentioned above, and, recognizing that three tunics are stronger and safer than either two or one to meet a strain, they advocate tying so gently as

¹ Read before the New York Surgical Society, March 26, 1902.

just to stop the pulse, depending upon cellular activity in the arterial walls at and near the point of irritation to obliterate its lumen finally and permanently.

Among most surgeons, in this city at least, the friction knot is relied on for major work; and we doubt the accuracy of Ballance and Edmunds's assertion that the double first turn does not in the least prevent relaxation while tying the second half of this knot.

A few members of this society are committed in their writings to the opinion that the "stay knot," so named by Ballance and Edmunds, is best; but to-day few, if any, of us would advocate, as they do in their book, the use of dentists' floss silk for ligation instead of absorbable material.

In London, torsion is more used than perhaps is the case anywhere else. I have seen Mr. Bryant, after amputating the thigh, twist the femoral vessels, and rely upon this alone,—which probably none of us would be willing to do.

Presumably each of us formulates rules for his own guidance. In my own work I have made three classes, as follows: I twist all vessels so small that I do not know the name of the vessel in question. Surely one can trust torsion in small vessels; and thus we may avoid, for the great majority of our spurting arterioles, the risk of having foreign material of whatsoever sort left in the wound.

For vessels large enough to have a name I tie either "granny" or "reef," and tie *three times* instead of the usual two, just to take no possible chances with slippery, wet materials. And for arteries of the largest size, I use the "friction" knot, with No. 1 or No. 2 chromic catgut, but again add the third turn—just for the satisfaction of the added safety. Maybe this is unnecessary, but it is the kind of crankism from which nobody dies.

To discuss, now, the technique of control of the large vessels in a major amputation, which is the chief purpose of this paper. As to the largest, the dangerous vessels, the surgeon about to ligate is now between Scylla and Charybdis. If he sticks to the admitted principles of modern teaching, and ties

so gently as just to stop the bleeding, he runs a risk—a very real one—that the forcible impact of blood by its incessant pounding may succeed within a few hours in rolling or pushing that ligature off the end, on the face of the stump. If upon the other hand he ties so tightly as to avoid all risk of this, it is more than likely that he has ruptured the innermost tunics, and to that extent violated the rule as to what degree of tension is safest to prevent secondary hæmorrhage. In this dilemma every surgeon whom I personally have seen operate has taken the latter horn of the dilemma as being the lesser evil, and tied very tightly.

About a year ago I had this matter brought home to me forcibly from a wholly unexpected quarter. I had just completed my thirty-sixth extirpation of the external carotid, and had tied, gently as usual, and nearly two centimetres proximal to its end, the external carotid stump. It chanced that in this instance the superior thyroid was given off from the common carotid, and there was no side-branch between the ligature and the common carotid. This fact, plus an exceptionally vigorous heart-action, will explain the sequel. The patient had been returned to his bed, and I was about to leave the hospital, an hour after completing the operation, when an orderly called me back in utmost haste. I found a nurse compressing the upper end of the wound, where it seemed blood had suddenly gushed forth, without avail. Of course the pressure was transferred instantly to the right place, and the wound torn open by the fingers without a moment's delay. Then the position was plain. That hammering heart had rolled that ligature over and over perhaps a dozen times, until at last it was slipped off the arterial stump, when the spout of blood followed.

The patient was almost in collapse. Keeping my finger firmly upon the artery, I ordered him put in Trendelenburg's position by aid of a chair upside down upon the bed. Then with a tin funnel we poured into his anus about three quarts of very hot water from the tap, in which a handful of table salt was hastily dissolved. The result of this and hypodermic restorative means was excellent, his life being finally saved.

But assuredly he would have died had we waited to prepare and use intravenously a sterile salt solution.

Taught by this terrifying accident, the writer now uses in ligating the carotid end the same methods which he has employed for a good many years past in all amputations, namely, to stick to our modern principles and tie gently, but to do so *by the aid of a semicircular needle and holder*.

The following are the steps found reliable in my own work: Let us assume that we are doing an amputation in mid-leg, for example. The bones being sawed, there remain perhaps a dozen or more artery clamps upon the face of the stump. All of these we may twist or tie as we see fit, except the three main arteries. These, as our chief source of danger, need respectful attention. Each clamp is made to include in its bite the two veins with the artery, and these are gently drawn upon to make them tense, while with the semicircular needle armed with chromic catgut a purse-string suture is made to surround them. It enters and leaves the flesh not more than three or four times in completing the circle, and goes as close to the vascular sheath as seems wise, at a depth of say two centimetres from the clamped ends. Now the catgut is tied gently, using the first half of the friction knot; the ligature ends are caught together with an artery forceps, and the forceps upon these vessels' ends—the artery and its *venæ comites*—is removed.

This procedure is repeated upon each until the anterior tibial, posterior, and peroneal are all treated alike.

Next the tourniquet is removed; and now we can observe whether the three ligatures are tight enough.

If so, complete the friction knot; if, instead, some one of them bleeds a little, it is easy to tighten just enough the first half of the knot before completing it by making the second half.

By this technique it is plain that it is impossible for the blood to force a ligature off the vessel-end; and the writer is convinced that a gain in safety would be made if this plan were adopted as a regular procedure.

Some few surgeons use the plan of Dr. Senn, but I think not many, so far as inquiry has served. That is, a double ligature upon the arterial end, leaving a dead space between. As to this, if the vessel is tied so gently by both these ligatures, as it should be, as to avoid a likelihood of rupturing the tunics, I am unable to see that two ligatures would be a much greater protection than one against the danger of their being hampered by the blood-impact off the end of the artery.

II.

The second part of this essay has reference to the anatomical guides for the ligation of sundry arteries as laid down or recommended in the various text-books upon operative surgery.

In the course of sixteen years' experience as a teacher in this field, I have now demonstrated each of these ligations some hundreds of times upon the cadaver, plus a fair degree of experience in living surgery covering a much longer time. In the case of several among the more important arteries, I have gradually become convinced that rules simpler, and sometimes also better in accuracy, can be adopted than those ordinarily taught.

1. The first of these will be the superficial femoral at the so-called "point of election," ordinarily given as four and one-half inches down a line running from the middle of Poupart's ligament to the adductor tubercle upon the inner condyle of the femur.

This rule obviously has disadvantages,—three measurements must be taken in order to operate by it.

That which I would suggest, instead, is the following: In a full-sized man, the point of election will be found seven inches down a line taking the shortest possible course from the anterior superior iliac spine to the middle of the popliteal space. Reasons: (a) This rule involves but one measurement. (b) The tape-line lies upon the skin its entire distance. (c) It requires only measuring the hypotenuse of the tri-

angle described by Scarpa, instead of finding half of its base line and then bisecting the triangle, which is the customary way. It is a scalene triangle, and the hypotenuse is a very long one, which is why the seven-inch mark happens to be exactly the same as a four and one-half inch one by the usual rule.

I believe the common femoral has never been found bifurcating lower than four inches down the accustomed line; hence the reason for adopting heretofore a four-and-a-half-inch point of election.

2. Ligation of the superficial femoral in Hunter's canal, *i.e.*, at any point in the middle third of the thigh; there being no femoral artery in its lower third.

This is the ligation called by more than one of the textbooks the "difficult ligation," to distinguish it from the one just mentioned at or about the apex of Scarpa's triangle. The only excuse for considering it difficult must be the fact that the vessel is here too deeply placed to permit of its pulsation being felt.

The rule which I would strongly recommend here enables the artery to be found as readily as the pulse at the wrist; and it is, I am convinced, the only way to make it so easy, namely, sharply to abduct the thigh and flex the leg, bringing the heel up against the perineum, or as nearly so as possible. An assistant also presses the knee downward towards the table. The limb is thus brought vigorously into the sartorial or tailor's position. In this position the adductor longus, one of the three sides of Hunter's canal, comes boldly up into relief as a firm, tense ridge. If now the incision be made lengthwise upon this ridge, and deepened along its upper surface, it will be wholly impossible to miss the artery.

The first muscle exposed in this incision will be the sartorius. It should be displaced upward (outward). It is recognized readily as being the only muscle upon the antero-internal surface of the thigh the fibres of which run downward and *inward*—all others here running downward and slightly *outward*; and again, the sartorius will be completely

relaxed and flabby in this position, while the adductor just beneath will be tensely rigid.

The roof of the canal, the fascia lata, is here transverse in the direction of its fibres. It is translucent, and through it we can clearly see the artery almost as readily as if through glass. Although in the accustomed position for ligation, the vein lies, in Hunter's canal, to the outer side of the artery, in *this* position now recommended the vein lies beneath the artery, very much as it is found in the ligation near the apex of Scarpa's triangle.

3. Ligation of the anterior tibial. The chief point worthy of mention here is one so striking as an anatomical fact that I am surprised that no work upon anatomy mentions it. Yet its accuracy as a fact I have demonstrated many dozens of times. I allude to the so-called "white line" between the tibialis anticus and the extensor longus digitorum. Whoever so named this must have been color-blind. It is a yellow line,—a line of fat between these muscles. When present it is an excellent guide; but in many cases, in the upper one-third to one-half of the leg, this yellow line is absent, or lost among the maze of vertical yellowish lines, a part of the deep fascia covering the muscles.

The curious fact is, that whether present or not in the upper part of the leg, this yellow line of guidance is *always* present in the lower half of the leg. It steadily broadens as it descends; and in the lower half is commonly at least as wide as a slate-pencil. Even in emaciated subjects in this lower region it will be found marked enough to serve as a guide.

In the lower ligation of this artery it lies between the same two muscles superficially; but upon separating them, cutting down through the yellow line aforesaid, we come upon a muscle not found in the upper ligation,—the extensor proprius hallicis.

Some twelve years ago, while teaching anatomy, it occurred to me that I never in my student days in Latin had come across any such nominative substantive as Hallux. Upon looking up the word, I found it in all works upon anatomy

and all medical dictionaries; evidently, however, copied from one to another, for it is not found in any Latin lexicon. There is, however, a Latin noun *Hallex*, one meaning of which is the pollex pedis, or great toe. Evidently this, then, is the proper word; and we should say extensor proprius *hallicis* (not hallucis), and should speak of hallex valgus, not hallux valgus. I referred the question for an opinion to Professor H. T. Peck, Professor of Latin in Columbia University, and have his letter stating that the facts are as I have just given them. Not an important point, of course, but we may as well be accurate. Perhaps ligation or non-ligation of the anterior tibial artery has more of a historic than a vivid present interest to us. I know at least one competent historian—with Southern sympathies—who has always maintained that if this artery had not been shot through—and not ligated—in the person of that great leader, General Albert Sydney Johnston, at the battle of Shiloh, it might at that critical juncture have reversed the outcome of the war of the rebellion.

4. Ligation of the external carotid. Here, after an experience of between fifty and sixty ligations of this artery upon the living, as well as a few hundred already alluded to in operative surgery tuition, I would say that I feel certain that if we carry our incision much nearer the median line of the neck than is usually advised—fully three centimetres nearer—we will both facilitate finding the artery speedily and be working in a more safe region for opening up our landmarks. Danger here, as in ligation of the other two carotids, lies towards the outer side; safety, towards the median line of the neck. As to length of incision, it must of course vary greatly, but I make the hyoid bone the mid-point in the length of my cut for this ligation.

If anything at all has been made very plain by my recent work upon this vessel (Gross Prize work), it is that it is an exceedingly safe and simple ligation, and never yet have I seen a secondary hæmorrhage from it. It seems probable that hereafter as a matter of routine, prior to what would be a very bloody operation, inviting death from shock, therefore—such

as excision of the upper jaw, as a single instance among many—surgeons will tie both external carotids as the first step of the operation. This does not in my experience occupy more than three to five minutes for each ligation; and thereafter the operation will be almost as bloodless as if upon a cadaver.

5. To approach the vertebral in the usual way is to enter the neck as low as possible, partly detaching the sternomastoid from its bony attachments, either behind or in front, in order to get room to work in a region full of jeopardy to life. For in close proximity to the vertebral in this region lie the phrenic and sympathetic nerves, the deep jugular vein, the pleura, the thoracic duct (on the left), the inferior thyroid vessels, etc.

This ligation really deserves its name of being one of the most dangerous. But all this risk is wholly unnecessary, except when the arterial ends must be found and secured in this region, to control hæmorrhage from a wound of it. If, however, the ligation is in continuity, all this risk is wholly unnecessary. The vertebral artery can be controlled almost as easily and safely as the pulse at the wrist. The incision should be identical with that used for ligating the common carotid at the "point of election," and should be deepened exactly as if that carotid were the object of our work. With a blunt retractor, the common carotid, its accompanying nerve and vein are drawn towards the outer side, leaving room for our work upon the vertebral.

Chassaignac's tubercle is now located about one centimetre, on an average, above the level of the cricoid cartilage of the larynx. Just within this is the foramen in the same, the *sixth* vertebra, which the vertebral artery first enters. It is only a trifling matter to divide the longus colli transversely, just below Chassaignac's tubercle, to come down upon the vertebral artery in a very safe region, and tie it. Nothing at all would be gained by ligating in a region at once lower in the neck and more dangerous, because this artery does not give off any of its branches until after it enters the foramen in question.

6. Ligation of the third portion of the subclavian artery.

A very few text-books mention, but most do not, the method of ligation of this artery which seems to me distinctly easier and safer than the one usually adopted; by which is meant the incision parallel to and just *below* the middle third of the clavicle instead of one just *above* that middle third.

Having tied both ways upon the same subject many times, —*above* upon one side, *below* upon the other side,—I am convinced that the latter plan is the best. But to carry it out properly, it is just as essential to have the shoulder raised as far as possible,—using the arm as a tractor,—as it is essential in trying above the collar-bone to force down the shoulder by the same means. In either case a gain in space for work of fully three centimetres results, and sometimes even more. Below the bone the relationship is in order from within outward, vein, artery, nerves. The latter, the brachial plexus, are in a close bundle, and need not be disturbed. They are first exposed, and the artery is found about one centimetre inward from them. This vessel also lies about two to three centimetres outward from the coracoid process. The vein,, as in the ligation above the bone, need not be seen, as a rule. After ligation, the cut fibres of the pectoralis major and sometimes of the deltoid must be sutured, of course. This incision, below the bone, is of obvious safety in case the wound suppurates. The upper ligation drains badly; this one drains very well. The lower cut also avoids having to divide the external jugular vein, and prevents all trouble with either the transversalis colli or the suprascapular vessels. Occasionally a supernumerary cervical rib gets in the way by the upper route. Upon the right side, in the usual incision, the deep jugular vein is in some little danger, and has been wounded. This is true, too, in a few instances, as to the phrenic nerve. Plainly, these risks are all non-existent in the lower incision.

Apparently, the one and only reason why the ligation through a cut below the clavicle has not long ago become the standard one is, the neglect to *elevate the shoulder* as the first step, and thereby to drag the collar-bone up out of the way. It is a fact that in the lower operation the point at which the

third portion of the subclavian is ligated is identical with the spot at which it is tied when reached through the more customary incision, *i.e.*, by the upper route, with the shoulder sharply depressed.

III.

The instrument which I call a ligation forceps is a very simple modification of the ordinary Wells' hæmostat, the jaws



Ligation forceps.

being turned nearly at a right-angle with the handle. This instrument I have used for many years. In excising forty-two external carotids upon the living subject I have necessarily had to tie in continuity and divide more than 250 branches, in addition to the main trunks; and have used this ligation forceps for all such work.

As compared with either the aneurism needle or a probe, this tool is blunter, and consequently is safer, being less likely to pierce a thin-walled accompanying vein.

After gently working its blunt point around the artery, the jaws are opened and the catgut end seized and withdrawn, after which it is used as a tractor until the knot is tied.

I would beg to commend this little tool to the goodwill of surgeons, believing that, when better known for this use, it will be considered the instrument of choice in all ligations in continuity.

A CASE OF TUBERCULOSIS, RESEMBLING CARCINOMA, IN THE TONGUE OF AN OLD MAN.

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THE following case was treated in the surgical service of Dr. Dudley P. Allen, Lakeside Hospital.

Mr. A. W., aged eighty years, farmer by occupation, came to the hospital, March 5, 1901. He complained of the following symptoms:

Three months ago there appeared on the tip of his tongue a small ulcer. The ulcer gradually increased in size and became more and more painful. On inspection, there was seen on the tip of the tongue, and slightly to the left side, a superficial ulcer about one centimetre in diameter and the same in depth. The margins of the ulcer were fairly smooth, the base was studded with little irregular elevations, yellowish gray in color. The base of the ulcer was indurated, its surface was ragged, and it emitted an offensive odor. On general physical examination nothing abnormal was found except the ordinary changes incident to age, and the patient's condition was excellent considering his advanced age. There was no palpable enlargement of the submaxillary lymph glands. The patient said that his general health had always been good, and he gave no family history of tuberculosis or malignant growths.

A diagnosis of carcinoma linguæ was made, and the removal of the ulcerated surface and its indurated base was advised.

On account of the age of the patient, it did not seem desirable to subject him to prolonged anaesthesia, so he was given ether rapidly, and before the stage of excitation was reached the tip of the tongue was seized with forceps, drawn outward, and a wedge-shaped piece of the tongue including the ulcer was rapidly excised. The incision was closed with interrupted silkworm-gut sutures.

The patient endured the operation well, and the wound healed by first intention. After leaving the hospital, the patient returned

several times, complaining of pain. The wound, however, seemed entirely healed.

The patient's physician, Dr. George Lathrop, of Dover, Ohio, reports that the tongue remained entirely healed until September 1, 1901, when a return of the ulcer was noticed on the tongue. This was followed by ulceration on the upper jaw on the left side. Later there was ulceration of the upper jaw on the right side and ulceration of the soft palate, which gradually extended up on the vault of the mouth. The patient's strength gradually decreased. He lost his appetite and took very little nourishment. Two weeks before death, the patient became hoarse, and found swallowing difficult. There was no development of tuberculosis in the lungs or elsewhere. The patient died December 15, 1901.

Pathological Report.—I am indebted to Dr. W. T. Howard, Jr., for reviewing the following report:

Sections made from the part of the tongue removed and through the ulcer and tissues adjoining included a mucous membrane covered with a layer of flat epithelial cells, a submucosa, and striated muscle tissue containing simple tubular glands and a large number of miliary tubercles. The ulcer had a ragged edge and extended through the mucous membrane and submucosa into the muscular tissue. The tissue just beneath this edge was composed mostly of small round cells having round nuclei with a small amount of faintly staining protoplasm. There was a small amount of homogeneous, intercellular tissue which was faintly stained with eosin. Farther from the surface there were a few scattered connective-tissue fibres and a greater number of small round cells. Below this there was muscle tissue which was infiltrated with a larger or smaller number of small round cells. The mucosa adjoining the ulcer was necrotic, and did not take the stain well.

The submucosa was somewhat infiltrated with lymphocytes. The connective-tissue fibres were indistinct and did not take the stain well. Scattered irregularly throughout the muscular tissue there were a large number of miliary tubercles. A typical one of these presented the following appearance: Rounded in outline, the extreme outer border being composed of a few faintly stained connective-tissue fibres. The greater part of the tubercle was composed of pale, necrotic material which had in it many small round cells, the greater number being around the periphery, where there were also a few larger cells, oblong in form with large nuclei, the

so-called epithelioid cells. The typical tubercle described had in it four giant cells. One was quite large and almost circular in form. Around the border were a large number of rounded nuclei. The centre was composed of pale, homogeneous material. The other giant cells in this tubercle were smaller, had fewer nuclei, and were irregular in outline.

The tissue was hardened in Orth's solution, and the sections were stained with hæmatoxylin and eosin. Sections stained for tubercle bacilli gave a negative result.

In comparing this case with a considerable number of others of tuberculosis of the tongue which have been reported, the most striking feature is the development of tuberculosis at the advanced age of eighty years. The usual time for the appearance of this disease in the reports of cases reviewed being all before or about middle age of life.

Another striking feature is that the ulcerated mass on the tongue presented the appearance of carcinoma rather than tuberculosis.

A third factor of importance is that the patient was apparently more than ordinarily robust for his age, and that he manifested no other evidence of tuberculosis.

In the cases reviewed, very few were found in which the tubercular ulceration did not come on secondarily to tuberculosis of the throat or lungs.

In tuberculosis of the tongue, it is quite the usual thing for the submaxillary lymph glands to be enlarged, and in some cases go on to caseation. In this case the glands were apparently normal.

PERSISTENT THYROLINGUAL DUCT; COMPLETE BRANCHIAL FISTULA.¹

WITH NOTE ON THE TEACHING OF EMBRYOLOGY BY MEANS OF CLAY MODELS.

BY HORACE J. WHITACRE, M.D.,

OF CINCINNATI,

Professor of Pathology, Medical College of Ohio; Surgeon to Christ's Hospital.

IN the present communication I wish to report two unusual cases of cervical fistula, and in connection therewith to call attention to a method of teaching embryology which I have used with satisfaction to myself and profit to my students during the past three years.

CASE I.—*Complete Branchial Fistula*.—I. R., aged five years. Family history good, except for petit mal in a brother who is seven years of age. A few weeks after birth, the mother noticed a small lump surmounted by a pin-sized opening on the right side of the neck, two centimetres above and to the right of the sternoclavicular articulation. A small amount of clear, sticky fluid exuded periodically from this opening. This condition has persisted until the present time without giving her much trouble. The secretion periodically dries on the skin surface and plugs the opening; the sac fills with the accumulated secretion; then washing or other mechanical means, sometimes the pressure of the retained fluid, removes the crust, and a considerable amount of this clear, stringy fluid escapes. The mother states similar material has been repeatedly and sometimes continuously expectorated at those times when the external discharge was slight. I was called to see the child because the swelling in the neck had become much larger than ever before and very much inflamed. The small orifice of the sinus was dilated by inserting a narrow-blade forceps and separating the blades. A small amount of mucopurulent material was liberated. On probing the sinus I found that it extended deeply, but was compelled to desist because of the violent coughing which was excited. The cause

¹ Read before the Cincinnati Academy of Medicine.



FIG. 1.—Complete branchial fistula of neck. *a* represents the site of the external opening of the fistula; *b*, a perpendicular line drawn over the centre of the sternum; *c*, an oblique line traced over the most prominent part of the clavicle.

of this coughing was at once demonstrated by the expectoration of a considerable amount of blood. It was at once evident that I was dealing with a complete branchial fistula (Fig. 1), and that I had the equivalent of a demonstration of this fact by the injection of a bitter or a colored fluid into the outer opening. An examination of the throat revealed the bleeding internal end of the fistula in the lower border of the right tonsil.

Operation.—The outer orifice of the fistula was removed with an elliptical piece of skin, and the incision extended upward along

FIG. 2.



Complete branchial fistula. The complete fistulous tract after its removal. The lower end was attached to the skin, and the upper end communicated with the throat in the tonsil.

the anterior border of the sternomastoid. The narrow, external opening widened out immediately into a large sac, the lower diverticulum of which extended down to or somewhat under the upper border of the clavicle. A minute dissection with a sharp knife was made, and this dilatation was soon found to narrow down like a cone as it was followed upward anterior to the sheath of the carotid artery and jugular vein. At the level of the upper border of the thyroid cartilage the sinus had diminished to the size of a hair, and would scarcely admit a fine probe. The course of the sinus was very deep at this point, and the dissection led

to the lower border of the tonsil, as had been demonstrated by the escape of blood at this point. The sinus was snipped off in the tonsil and removed intact as one continuous trumpet-shaped tube which had extended from the sternoclavicular articulation to the right tonsil. A photograph of the specimen is presented in Fig. 2. Healing after operation was perfect, and there has been no recurrence of a fistula.

CASE II.—*Fistula from a Persistent Thyrolingual Duct.*—H. M., aged eighteen years, male, white, not married. Family history negative, personal history of children's diseases. Two and one-half years before he first consulted me, the patient had noticed a small swelling the size of a pea on the left side of the thyroid cartilage and about its middle. This swelling increased rapidly in size for one week, until it became one-half an inch in diameter, then broke spontaneously, and discharged about one-half teaspoonful of bloody fluid. This swelling was accompanied by redness, but no pain. In one week's time the discharge continued but was mucous in character. A discharging fistula has persisted for the entire period of two and a half years. During this time the outer opening has repeatedly crusted over for a few days, then, with the friction of washing, the crust would be removed and the same stringy mucus would escape. His family physician has repeatedly slit up the sinus tract, with no improvement. Dr. Thorner curetted the fistula, but it was not cured. When I first saw the patient, the entire lesion consisted in a minute fistulous opening over the middle of the left thyroid cartilage. This fistula discharged two or three drops per day of an opalescent, stringy mucus. A probe could be passed only one-fourth of an inch upward in the direction of the body of the hyoid bone.

Operation.—The fistulous tract was followed up to the body of the hyoid bone and excised intact. A sinus persisted over hyoid. At the second operation, a side branch was discovered which led upward to the left side of the neck for a distance of two inches. This projection ended near the apex of the styloid process of the temporal bone. This operation was considered to be final, but the sinus persisted over the hyoid. A third operation, done in consultation with Dr. P. S. Conner, revealed a second projection, which followed the direction of the fetal thyrolingual duct from the foramen cæcum to the body of the hyoid bone.

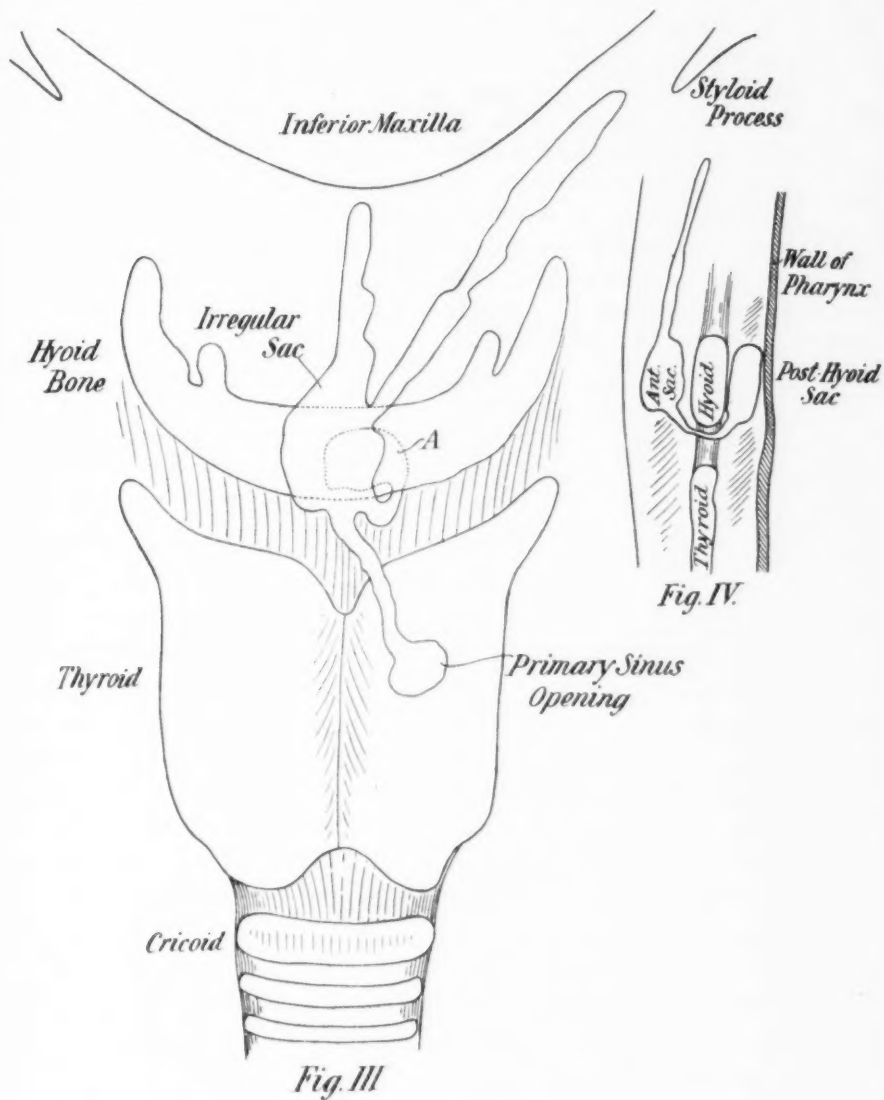


FIG. 3 shows in a rough way the anatomical position of the various ramifications of the epithelial-lined tracts found in Case II. The dotted line at *A* represents the postthyroid sac which communicates with the remainder by a narrow neck below the hyoid bone.

FIG. 4 shows a median sagittal section, and gives the relations of the two sacs to the hyoid bone.

This duct was cleanly removed, but the sinus persisted after operation. At a fourth operation, a clean anatomical dissection was made of this entire region, and, to complete this thoroughness of dissection, the body of the hyoid bone was cut away. Here was found the cause of the last failure. A sac the size of a pea was disclosed, and pressure on this sac caused the typical whitish fluid to exude from an opening at the lower border of the bone, which was so fine that no probe could enter it, and certainly no eye could see it. This sac was excised. The result of this operation was the complete cure of the fistula, and there has been no recurrence during the three years that have intervened since this last operation.

This case presents some difficult embryologic problems, and at the same time illustrates the difficulties in the complete extirpation of some of these cysts, together with the certain failure to cure the conditions so long as the least remnant of such *epithelial-lined* fistula remains behind. The side tracts in this case were not carelessly overlooked, but the openings into them from the main sac were so minute that no probe could enter them and no eye could detect them in a wound. Colored materials were injected, but gave no help. The only guide was the thin sac wall, and this narrowed down to such a small neck that the question constantly arose as to whether we were dealing with a connective-tissue band or an isthmus between two sacs. The fistulous tracts, dissected out at the time of each operation, were demonstrated by microscopic examination to be lined by epithelium. The median tract running from the body of the hyoid bone to the floor of the mouth as well as the small sac behind the hyoid bone can readily be explained, since they occupy the position of the fetal thyro-lingual duct. The tract leading downward and to the left as far as the middle of the thyroid cartilage on this side, where the external opening was primarily found, must be explained either as an extension downward from the median line by suppuration or as an unusual anomaly in development. The tract leading from the body of the hyoid bone upward to the apex of the styloid process of the left temporal bone is not

easy to explain. It is possible that it represents an incompletely closed second cleft. That is, the tonsillar end had closed, also the sinus precervicalis had closed over on the neck surface, and a completely closed epithelial-lined tract resulted. In what way this tract became connected with the median thyrolingual duct I am unable to explain embryologically; indeed, I am not certain that it did communicate before my first operation. It is possible that during the dissection of the first operation this closed canal was incised, and that at the time of the second operation this newly opened tract appeared to open into the same cavity as the posthyoid cyst.

In a second case of persistent thyrolingual duct or of cyst resulting from such foetal remnant, I think that I would explore the posthyoid region as a routine part of the dissection.

THE TEACHING OF EMBRYOLOGY BY MEANS OF CLAY MODELS.

Inasmuch as the explanation of the two cases reported is to be found in a defective embryologic development, I have considered that it would be profitable to demonstrate in clay first the complicated process of development in the neck region, then the manner in which these developmental processes may go wrong and result in the two varieties of fistula that are reported.

The method of teaching embryology by means of clay modelling, conducted before a class, was suggested to me, *first*, by my own total inability, as a student, to understand embryology from drawings, pictures, and sections; and, *second*, by the great aid given by reconstructing the embryo in wax from microscopic sections. Three dimensions are certainly essential to a complete understanding of the complicated process of development, and I believe that my students get a more complete memory picture of developmental processes by this method of teaching than by any other. Furthermore, the teacher's burden is much lessened. It is a comparatively simple matter to demonstrate by means of clay how a

flat disk may become a tube; how a groove may appear here a fold or a bud, or a thickening or a thinning there, and so on until every detail of the completed structure has been built up.

The materials needed are 100 pounds of modelling clay such as artists use, a few wooden spatulas, ten pounds of thin sheet-lead cut in strips one inch wide, and two or three colors of flannel. A large shield-shaped piece of clay will represent the mesoblast, a sheet of red flannel over its upper surface the epiblast, and a sheet of blue flannel on its under surface the hypoblast. The epi- and hypoblast continue for the most part as single or as very thin layers of epithelial cells to the full term of development. The flannel can therefore be used throughout to represent these layers. The complicated developmental processes occur almost entirely in the mesoblast, and a clay of proper consistency can be modelled to represent every stage, while the two layers of flannel will be made to follow every variation in the contour of the clay. The development of the brain from the epiblast will of course be conducted in clay as a separate model, as will likewise the eye, the ear, etc.

The following conclusions drawn from such embryologic study bear directly upon the two cases reported:

(1) That the mesoblast in the neck region undergoes complete circular segmentation to form five so-called branchial arches, and that between these arches there are deep fissures, both on the inner and on the outer surface, which are separated from each other only by a double layer of epithelium (the epi- and the hypoblast).

(2) That a persistence of these clefts may form a blind external or a blind internal pocket, and that a breaking through of the separating membrane will form a free communication between the skin surface of the neck and the throat.

(3) That the first cleft maintains its foetal arrangement and forms the auditory canal. The double layer of epithelium forms the ear-drum. This cleft cannot therefore form a branchial fistula.

(4) That the second cleft has its inner opening in the region of the tonsil.

(5) That the outer surface of the neck becomes so flexed that a pit forms (the sinus precervicalis). The bottom of this is formed by the third, fourth, and fifth branchial arches and the second, third, and fourth clefts. This pit gradually closes over the top even with the body surface and buries the original clefts. It is therefore apparent that a complete failure in the closure of the second, third, or fourth cleft would result in a tract leading from the throat into this pit, and that a complete branchial fistula, as in Case I, must be the result of an additional fistula connecting the skin surface with the pit, *i.e.*, a failure of the pit to close completely. (In Case I the lower opening and fistula represent the opening into the pit; the large dilatation represents the pit, and the narrow channel leading up to the tonsil the branchial cleft.)

(6) The defect in the outer wall of this pit may be at any point on the side of the neck, from the angle of the jaw to the clavicle, from the median line to the posterior border of the sternomastoid.

(7) The third cleft never forms a fistula.

(8) The fourth cleft never forms a fistula.

(9) The second branchial cleft is the one that invariably gives rise to these fistulæ, and while the outer opening of such a fistula may be anywhere on the side of the neck, the inner opening is always in the region of the tonsil, the primitive position of the second inner cleft.

(10) Fistulæ never open into the larynx or trachea because the respiratory bud comes off below the branchial arches and clefts.

(11) Median branchial fistulæ do not exist. The outer opening may be in the median line, but the tract soon deviates to one or the other side.

(12) The thyrolingual duct may give rise to fistulæ and cysts, and these must of necessity be situated in the median line and either below the hyoid bone, behind the hyoid bone just above the hyoid bone, or in the floor of the mouth.

To this may be appended a few clinical conclusions:

(1) Branchial fistulæ usually manifest themselves before

the age of twenty, but may not appear before the age of forty-five or fifty-seven, as has occurred in reported cases.

(2) Embryonal defects are often hereditary. One observer reports five cases occurring in one family; another, the occurrence of the same condition in brothers.

(3) A very large proportion of branchial fistulæ are complete, but are not recognized as such because the tortuous nature of the sinus baffles probing. The injections of a bitter fluid which the patient may taste, or the use of colored fluids which may be seen, will aid much in establishing this point.

(4) The secretion is usually slight and mucous in character, or opalescent and sticky, and contains epithelial cells.

(5) The size of the outer opening is no guide to the size of the sinus, but a small skin opening often indicates a large cavity underneath.

(6) The wall of the sinus is usually made up of fibrous connective tissue.

(7) The interior of these sinuses or cysts is invariably lined by flat or ciliated columnar epithelium. In the complete fistulæ the upper half of the sinus is often covered by ciliated epithelium.

(8) The only rational treatment is complete excision of all epithelial covered surfaces.

(9) The failure to remove all epithelial covered surfaces will certainly be followed by a persistence of the fistula.

CYSTS IN CONNECTION WITH THE TEETH.¹

BY JOHN CHADWICK OLIVER, M.D.,

OF CINCINNATI,

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THE teeth, particularly unerupted ones, have for years been recognized as etiological factors in the production of neoplasms affecting either the upper or lower jaw, but, in spite of this fact, little attention has been given to the subject by writers upon surgical topics. This lack of literature has perhaps led to misapprehensions regarding diagnosis and treatment, and conservative methods which would result in benefit to the patient have too often given place to uncalled-for radical operations obviously detrimental to the comfort and appearance of the patient.

CASE I.—The first case that attracted my attention particularly to this subject was that of J. W., a young man twenty-five years of age. He had had a persistent sinus in the region of the left upper first bicuspid tooth for nine years. He had been operated upon several times for alveolar necrosis, but without benefit. The continued suppuration and accompanying odor distressed the patient beyond measure. He had about made up his mind to adopt the suggestion of one of his physicians, *i.e.*, have excision of the superior maxilla made.

When examined, October 11, 1898, a very considerable thickening and hardening of the maxilla existed in the alveolus between the left lateral incisor and the first molar of the upper jaw. The canine and both bicuspid teeth were absent. The second bicuspid and the canine had been extracted, but no history of the first permanent bicuspid could be obtained. He thought it had never been present. A large mass of very hard bone, presenting a worm-eaten appearance, projected beyond the gum in the space

¹ Read before the American Surgical Association, June 5, 1902.

mentioned above. A sinus existed at the anterior part, that is, in the region of the socket of the canine tooth. A probe could be inserted into this sinus for one and one-half inches. The probe also showed that the area of necrotic bone was limited for the most part to the superficial portion of the alveolar ridge, and that the body of the bone was not involved. A sinus also opened through the lateral wall of the left nasal fossa. A probe introduced through the sinus in the mouth could be brought into contact with one passed through the lateral wall of the nose. The sinus opening into the nose passed through the bony structures. There was a localized tender area of fulness just below the inner half of the floor of the orbit.

The patient was free from syphilitic taint, and he had no recollection of any injury to his jaw or face.

The sinuses were reamed out by means of a small, sharp spoon. They led to the point on the anterior surface of the superior maxilla indicated by the area of fulness and tenderness above referred to. A bicuspid tooth (Fig. 1), perfect as to crown but with imperfect roots, was found at the bottom of the sinuses embedded in the superior maxilla, but anterior to the maxillary sinus. After its removal the parts were thoroughly curetted. The after-history is that of rapid closure of the sinuses and cessation of suppuration.

CASE II.—M. B., aged ten years. An attempt to extract a tooth two and a half years before resulted in the right, lower, lateral incisor being broken off. A short time afterwards a painful swelling made its appearance on the alveolar border just to the right of the central incisor. This enlargement was very painful for a time, but this feature soon disappeared. The augmentation of the growth was very gradual.

Examination of the case in May, 1901, revealed a dense fluctuating tumor, bluish in color, with tortuous vessels coursing over it. The alveolar edges had been forced apart by the growth and absorption of the inner wall had progressed so far as to permit the mass to project under the mucous membrane in the floor of the mouth. The mass was not tender. Fluctuation was evident, the sensation being that of a tense capsule containing fluid. No "crackling" could be elicited by pressure.

An incision under chloroform was made June 4, 1901, at the Presbyterian Hospital. This permitted the fluid to escape, and



FIG. 1 shows teeth removed from the interior of these cysts. They show a perfect condition of the enamel and crown of the tooth, but imperfect roots.

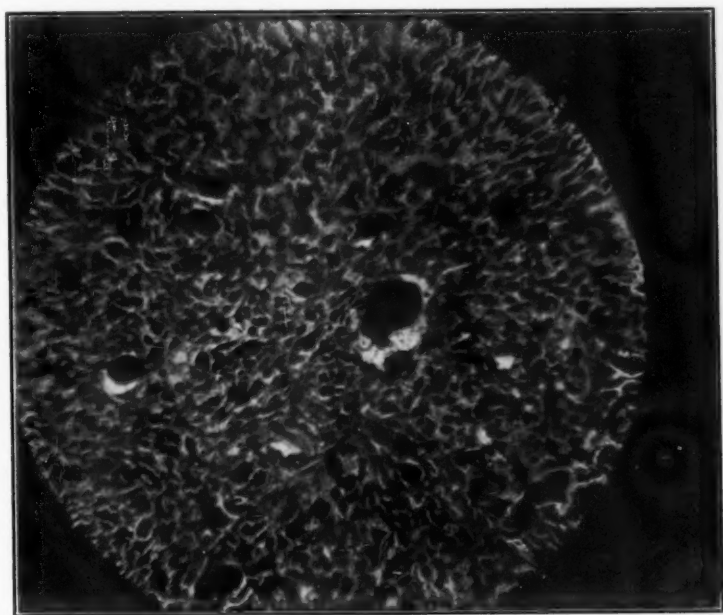


FIG. 2 is a photomicrograph of the giant-celled structure from the wall of the cyst in Case II.

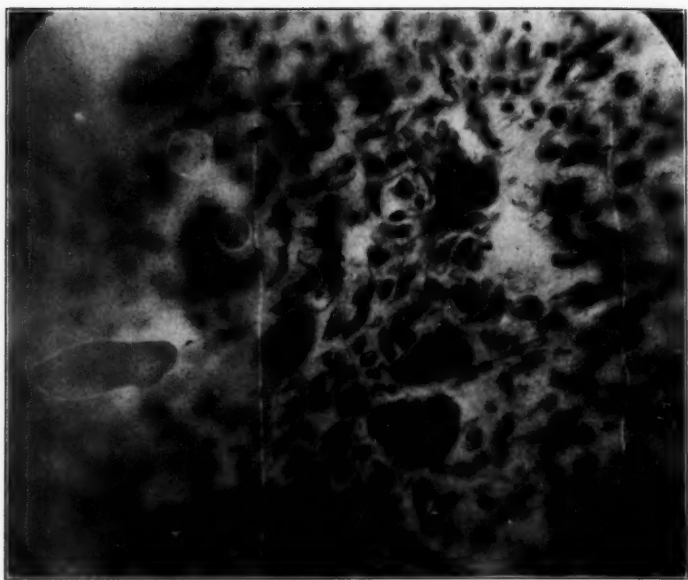


FIG. 3 is a section from the interior of the cyst in Case III.



FIG. 4 is from the inner wall of the cyst in Case III. This was removed at the second operation. It shows the fingers of the granulation tissue.

exposed a reticulated interior,—bony spiculæ were found in the partitions. A permanent incisor (Fig. 1) and canine tooth were found within the sac. Their roots were directed obliquely outward and downward, the crowns projecting inward and upward. The cyst wall extended backward to the proximal surface of the first bicuspid tooth. (The curetting so loosened this as to demand its removal.) A careful examination showed that the cyst extended to the neck of the teeth. It did not extend downward upon the roots.

The cavity rapidly contracted and healed under gauze packing and antiseptic washes. The patient has remained well.

Microscopic examination of sections of the cyst disclosed a typical picture of myeloid sarcoma. (Fig. 2.)

CASE III.—(Notes and microscopic sections furnished by H. J. Whitacre, M.D., in whose practice the case occurred.)—E. H., aged twelve years, had a family history of tuberculosis. The patient had been a delicate child. Nine months previous to coming under Dr. Whitacre's observation the patient suffered much pain in the molar teeth on the left side of the lower jaw. The permanent teeth, with the exception of the molars, bicuspid, and canine on the left side of the lower jaw, were erupted. These teeth failed to appear, but the gum in the region of the molars increased progressively in size until (May 22, 1900) a tumor the size of an English walnut had formed. Dr. N. P. Dandridge operated upon this growth. He removed the mass and some buried teeth. Sections of this growth led the microscopist to the opinion that it was a giant-celled sarcoma. (Fig. 3.)

At a later date, seven weeks before coming under Dr. Whitacre's care, a tumefaction made its appearance in the region of the canine tooth on the same side of the mandible. The left permanent canine was absent, but its fellow on the opposite side had erupted twelve months previously.

The swelling referred to above was firm. It was located upon the inner side of the lower jaw, extending from the mid-line to the position of the second bicuspid tooth in its long diameter and from the upper to the lower border of the bone. The tumor was about the shape and size of a pigeon egg bisected longitudinally. The bone was much thickened. The swelling was covered by normal mucosa, was not sensitive, and was very firmly

attached. There was no enlargement of the cervical lymphatic glands.

In view of the apparent recurrence after the previous operation, the diagnosis was in doubt until an incision revealed a cyst containing a small amount of fluid and a canine tooth. The tooth projected inward and upward into the cyst cavity. Its crown was well formed and projected into the cyst to about the same extent that the normal teeth protrude beyond the gum. The root of the tooth seemed to be well formed. The patient recovered rapidly from the condition and has remained well.

Sections of the mass showed granulation tissue with inflammatory papillæ dipping into the interior of the cyst. (Fig. 4.) It did not resemble the tissue removed at the previous operation.

The history of this class of cases practically began with Christopher Heath's series of masterly articles on the subject published in the *British Medical Journal* for 1883. These articles were subsequently published in book form under the caption of "Injuries and Diseases of the Jaws." The author mentions the fact that isolated examples of the affection had been published by Fergusson and others, but he calls attention to the meagreness of the literature upon the subject.

Dr. W. P. Bolles contributed a most complete article upon this affection to the *Boston Medical and Surgical Journal*, September 7, 1871. He may therefore be considered a pioneer in the attempt to elucidate the problems connected with dentary cysts. His observations were confined to cystic growths.

Sir John Tomes ("A System of Dental Surgery," 1887) was an early and intelligent contributor to the literature.

A proper conception of the pathology of these cysts is unattainable without a careful consideration of the developmental period of the teeth. In one respect embryology seems to cast much doubt upon the ordinary conception of the pathology and pathological anatomy of these growths. (Fig. 5.) Investigations regarding the developmental period show that one part of the teeth, the enamel, is a direct derivative of the overlying ectodermic epithelium, while the pulp, dentine, and cementum are derived from the mesoderm. In the sixth week

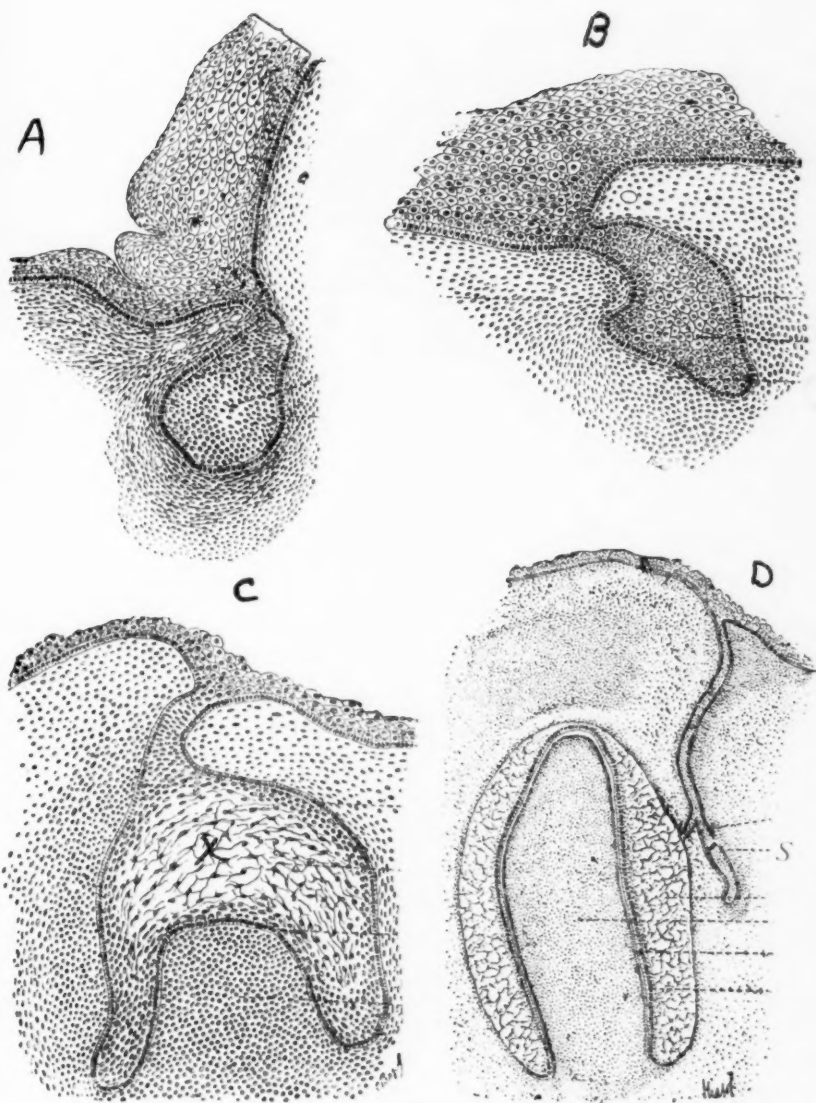
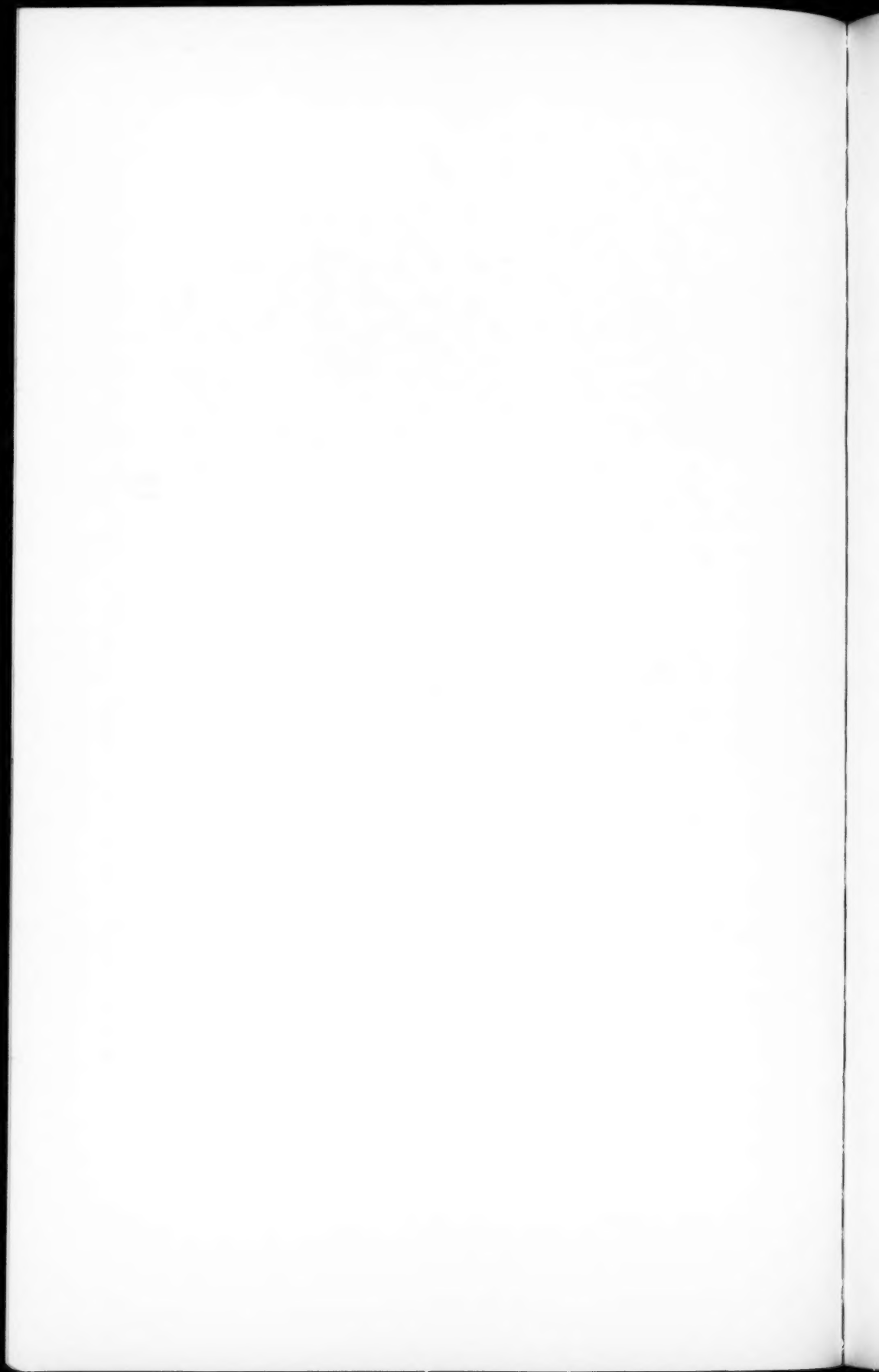


FIG. 5.—Diagram taken from Böhm-Davidhoff's text-book of histology. *A* and *B* show the enamel shelf from which the enamel organ develops downward and backward. *C* shows the papilla pushing up into the enamel organ, a mesoblastic structure, and, in addition, shows the liquefaction process at *X*. *D* shows the further development of the papilla, which now takes the form of a tooth. At *S* the epithelial bud has appeared that is to form the permanent tooth.



of intra-uterine life the epithelial cells upon the surface of the gums multiply and grow downward into the subjacent mesodermic layer in an oblique direction towards the lingual surface of the gum. This ingrowing epithelial (dental) shelf divides into ten indentations, which become the enamel sacs or primitive enamel germs, the enamel of the teeth being derived from them. (Figs. 6, 7, and 8.) The cells between the individual enamel germs disappear, and thus the germs become separated from each other and from the epithelial cells of the surface. In this manner they become true epithelial implantations. Conical projections (dental papillæ) are sent up from the mesodermic layer, one for each enamel organ. (Fig. 9.) These projections are the forerunners of the dentine and pulp of the teeth. The enamel organs and the papillæ grow towards each other, and later the enamel sac caps the papilla. The crown of the tooth alone becomes covered with enamel. The remainder of the enamel organ is found upon the free surface of the tooth for a variable time. It is called the membrane of Nasmyth. (Figs. 10 and 11.) The dentine arises from an active multiplication of the mesodermic (connective tissue) cells. The connective-tissue cells upon the surface of the papilla constitute the odontoblasts (modified osteoblasts). Calcification (dentine) begins upon the surface of the papilla and progresses towards its centre, but it is not complete. The osteoblasts continue the formation of dentine until the dental papilla is entirely surrounded by it. What remains of the papilla constitutes the pulp. During the metamorphosis of the dental papilla, the mesodermic tissue immediately surrounding it undergoes slight condensation to form the follicle of the developing tooth. As the enamel organ recedes from the surface, the follicle increases to such an extent as to envelop the entire rudimentary tooth. That part of the follicle which covers the future root of the tooth undergoes partial transformation into true bony tissue and gives rise to the cementum or crusta petrosa, while the unossified external fibrous layer constitutes the lining periosteum of the alveolus. The development of the permanent teeth is precisely analogous to that of

the milk teeth. The enamel germs for the permanent teeth, with the exception of the molars, bud from the lingual side of the dental shelf in the seventeenth week, the germ for the first permanent molar appearing about a week earlier at the posterior extremity of the dental shelf after the manner of a milk tooth. The germ of the second molar buds from the neck of the first molar in the third month after birth, while that of the third molar springs from the neck of the second about the third year. At birth, therefore, the gums contain the two sets of teeth except the second and third permanent molars. (This account of the embryology of the teeth is taken almost bodily from Heisler's text-book of embryology.)

All writers upon this subject seem to agree in believing that cystic growths connected with the teeth may be of two varieties, *i.e.*, (1) cysts connected with the roots of the teeth; and (2) those connected with the crown of the tooth or several teeth. Much confusion has existed in the matter of classification, because various writers have assumed that all cysts of the jaws have a common point of origin. Eve (*British Medical Journal*, January 6, 1883) makes the statement, "I think all the tumors belong to the same group, the individual specimens presenting only differences in degree of development."

Broca ("Traité des Tumeurs," Vol. ii, p. 35) declares that "The great majority of cysts of the jaws have their origin in tooth follicles."

Magitot (*Arch. Gén. de Médecine*, 1872-73) describes cysts of small size in connection with the fangs of permanent teeth. He gave these the name of periosteal cysts.

Sir John Tomes ("A System of Dental Surgery") divides dentary cysts into two varieties,—those connected with the crown and those connected with the fangs of the teeth.

In view of the method of development of the teeth, it seems highly probable that two varieties may develop,—one of ectodermic and the other of mesodermic origin. The former should contain epithelial structures, while the latter should not.

J. Bland Sutton ("Tumors Innocent and Malignant," 1893) groups all of the neoplasms connected with the teeth

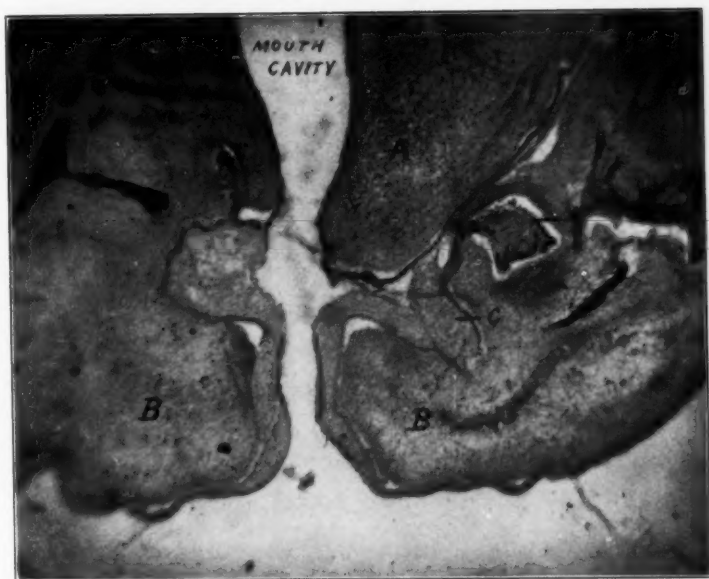


FIG. 6 is a photomicrograph of a sagittal section taken through the region of the canine tooth in a fetus of eight to ten weeks. *A*, tongue; *B, B*, upper and lower lips; *C*, dental shelf; *X*, the enamel organ, which is connected with the dental shelf by a long, narrow neck.



FIG. 7 represents a higher magnification of the same enamel organ from the same specimen.

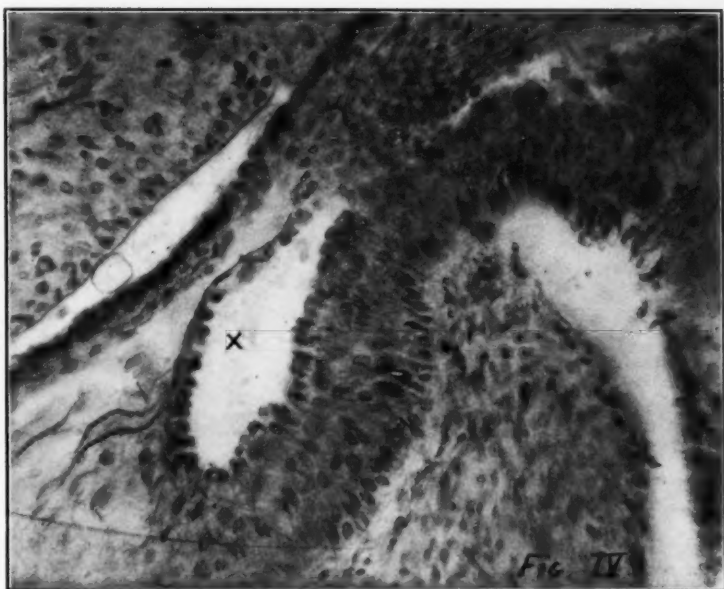


FIG. 8 is a still higher magnification of the region surrounding X, and will show the definite epithelial structure of this neck as well as the direct continuation of the Malpighian layer of the mucosa into it.



FIG. 9 takes us much farther along in the development when the remaining elements of the completed tooth begin to appear. This is again a sagittal section in the region of the canine taken through the decalcified jaw of a fetus eighteen weeks old. The entire structure is now deep in the gum (*a*). The enamel organ has liquefied at *b*, and leaves only the single row of epithelial cells (*c*), which is continuous over the interior of the sac thus made and over the apex of the papilla (*d*), which pushes up from below.

That portion of this epithelial layer alone which caps the papilla becomes the enamel producing section, while the mesoblastic papilla, pushing up under and into this enamel sac, gives rise to the pulp and the dentine of the tooth.

e represents the location of the condensed mesoblastic tissue surrounding the tooth known as the follicle wall, and that portion of this follicle wall below the asterisk subsequently forms the cementum of the tooth.

The apex of the papilla requires further study in Fig. 10.

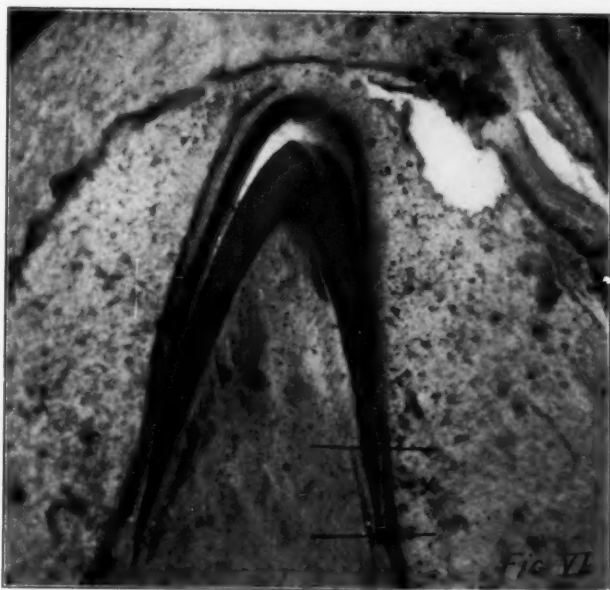


FIG. 10.—Three zones are seen on the left hand side of the apex. The outer zone is the single row of columnar enamel cells. The middle darker zone is the layer of enamel which these cells have produced. The inner and broader zone is the dentine. The centre of the papilla is the pulp. The dentine is produced by the odontoblasts which form the surface layer of pulp-cells, and are best seen by magnifying the area (X).

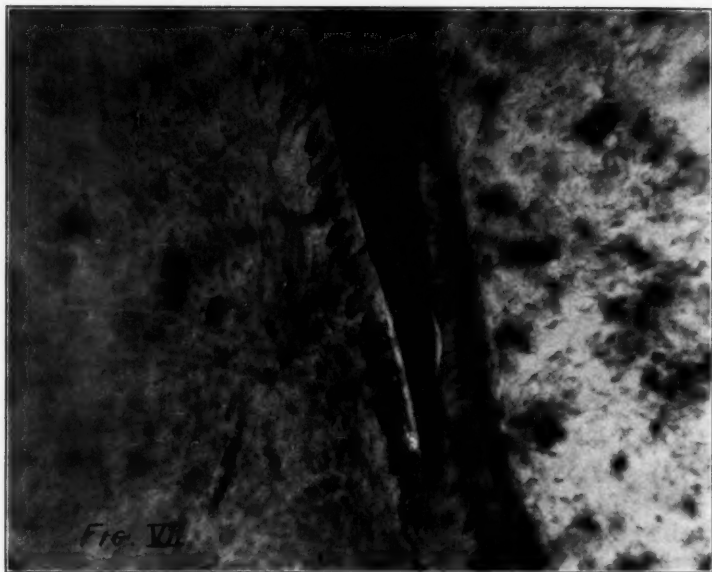


FIG. II shows such magnification. To the left of the three diagonal bands is the pulp. The band to the left is the layer of columnar odontoblasts; the middle band is the dentine that has been produced by these cells; and the right hand band is the row of enamel cells which have not yet produced enamel this far down.

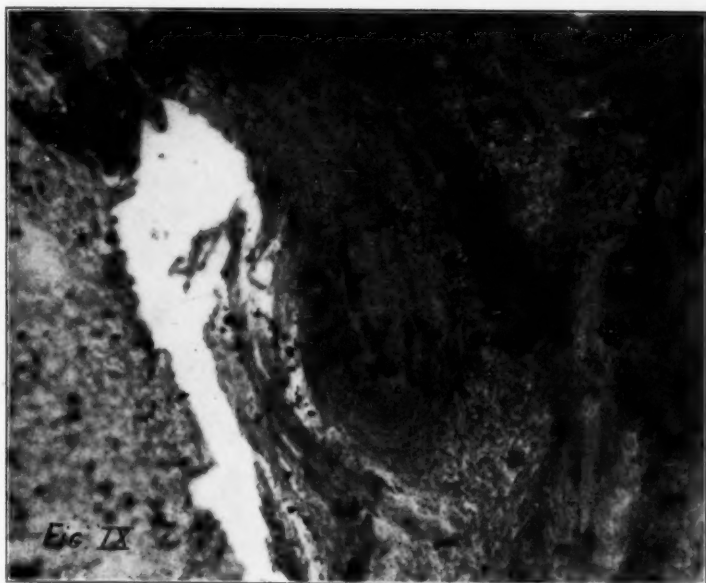
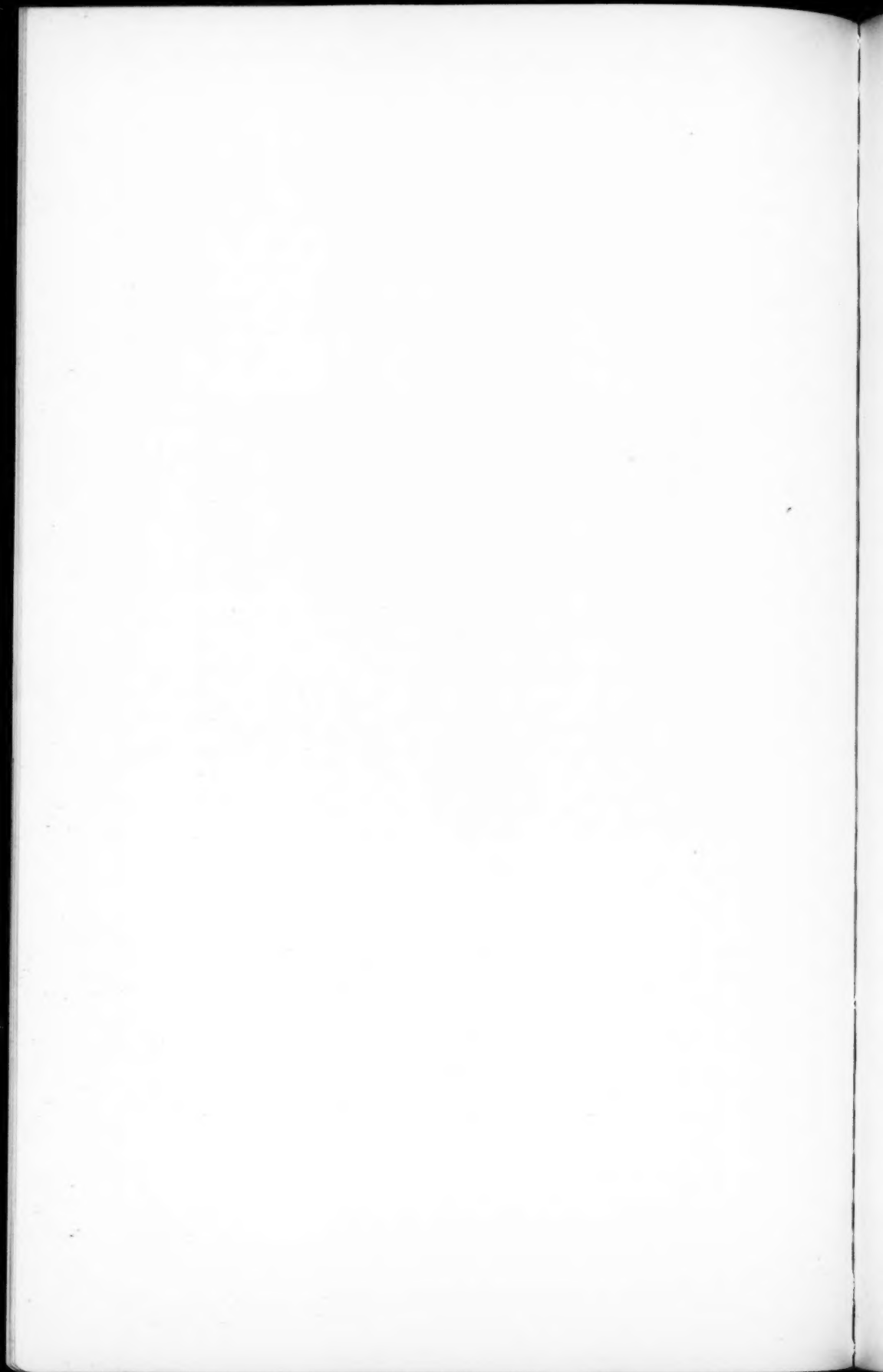


FIG. 12 is merely a magnification of the tip of the enamel organ of the permanent tooth, and will serve to show both its epithelial structure and the condensation of the surrounding tissues to form a tough membrane, which latter may be of pathologic importance.



under the "odontomata," and classifies them according to the anatomical elements entering into the formation of the teeth;—his grouping may be said to be based upon the embryology of the teeth, and hence follows the correct method. According to this author, the following classification is the correct one:

- | | |
|--|----------------------------|
| 1. Epithelial odontome, from the enamel organ. | |
| 2. Follicular odontome. | |
| 3. Fibrous odontome. | } From the tooth follicle. |
| 4. Cementome. | |
| 5. Compound follicular odontome. | |
| 6. Radicular odontome, from the papilla. | |
| 7. Composite odontome, from the whole germ. | |

The vast majority of examples of this affection occur in patients under thirty years of age. Statistics seem to bear out the statement that cystic growths occur at or shortly after the period when the affected tooth should, under ordinary circumstances, be erupted. The third molars on the lower jaw are relatively more frequently affected than any of the other teeth; this is probably due to the fact that they are commonly the last teeth to make their appearance. The canines, usually erupted about the twelfth or thirteenth years, are the next most frequently involved. The incisors, first and second molars, and second premolars are the seat of trouble in about equal proportion. The first premolars are least frequently affected.

These growths occur with about equal frequency in each jaw; possibly the mandible is somewhat more apt to be involved, but not distinctly so. As these growths almost invariably occur in connection with permanent teeth (one connected with a temporary molar is mentioned by Mr. Salter as occurring in the practice of Mr. Alexander Edwards), it may be assumed that there may be a causal relation between their development and irritation in their vicinity at or about the time for their eruption. The mere retention of a permanent tooth within the substance of the jaw after its regular time for eruption, or even its permanent retention, does not seem to be an etiological factor of much importance. It is not at all

unusual to find families in which certain teeth of the permanent set fail to erupt at all; and it is curious to note the uniformity of this deficiency in the various members. For instance, I know a family in which for four generations several of the members in each generation fail to have the upper permanent left lateral incisor and canine teeth appear. An examination, however, proves these teeth to be present in the jaw, but unerupted. None of the members of this family have ever been afflicted with any growth connected with these teeth. They have almost without exception retained the corresponding deciduous teeth until after they were thirty years of age.

Dentigerous cysts have occasionally been found in connection with a supernumerary tooth. (Eugene Talbot, *Chicago Medical Journal and Examiner*, February, 1882. Christopher Heath refers to another similar case reported by Mr. C. J. Fox.)

Sir William Fergusson reported a case of dense osseous tumor of the upper jaw, which, upon section after removal, proved to contain a tooth embedded in its centre. Dr. P. S. Conner has in his possession a beautiful specimen of the same nature.

Cysts and tumors have also been found in connection with imperfect teeth.

Misplaced and inverted teeth have been the apparent starting-point of neoplasms and cysts.

As a general rule, but one tooth is found within these cysts, but, very rarely, two teeth may be included. The second case reported in this paper is an example of this rare condition.

But little is known of the exciting causes of this condition. Mr. Tomes explains the formation of cysts in connection with retained teeth by referring to the fact that "when the development of the enamel of the tooth is completed, its outer surface becomes perfectly detached from the investing soft tissue, and a small quantity of transparent fluid not uncommonly collects in the interval so formed. This fluid ordinarily is discharged when the tooth is cut, but when, *from some cause*,

the eruption of the tooth is prevented, it increases in quantity, gradually distending the surrounding tissues in the form of a cyst."

More remarkable and more unsatisfactory is the explanation given by Mr. Heath that "dentigerous cysts arise in connection with teeth which, *for some reason*, have remained within the jaw and have undergone a *certain amount of irritation*."

Several other explanations are possible, for instance, first, misplacement of the dental germ, either in reference to position and depth in the gum tissue or in reference to the axis of embryonal development and embryonal forces. Second. Embryonal rests. The neck of the primitive bud that springs from the primary enamel germ for the development of the permanent tooth may persist and develop cysts in definite relationship to the crown of a fairly well-developed tooth. Such a process is entirely analogous to the rests of the ovary which are left after the infolding of the germinal epithelium, and which are responsible for the cystadenomata of the ovary. (Valentine, "Pflüger Ducts.")

Third. Failure in evolution. (A) The membrane of Nasmyth may become unusually thick and tough and fail to resorb. This may occur with a normally placed follicle, but more particularly when the axis is misplaced and it lies in an oblique, transverse, or reversed position. (B) The wall of the follicle is unusually dense and resistant, giving rise to a similar series of changes to the above. (Fig. 12.) A general or partial jumbling of the enamel and dental papilla at the time of their formation may take place.

Fourth. Irritation. (A) The proliferative activity of the cells concerned in the evolution of the teeth, by reason of displacement, does not meet with the normal juxtaposition and arrangement of cell force and interaction that are believed to be requisite to the normal histologic arrangement of cells in their development. This results in a proliferative activity on the part of the cells of the dental papilla; or, as occurred in the three cases reported and as most often occurs, the sur-

rounding periosteal and their connective-tissue structures undergo proliferation. The histologic structure of the tissue found in the cysts reported is that of giant-celled sarcoma, but they are not sarcomata. They are composed of connective tissue which has reverted to an embryonal or granulation tissue type under the influence of prolonged irritation. (B) The mechanical irritation by an obliquely or transversely placed tooth crowding into the side of an alveolar border may certainly give rise to the same irritative changes that have just been described, and may also explain the three cases reported. The interior wall of the cyst in Case III showed typical granulation tissue. This irritative change is analogous to that found around encysted bullets or other foreign bodies.

M. H. Fletcher, M.D., D.D.S., of Cincinnati, suggests the following ideas in regard to the pathology of this affection.

" At the time of the eruption, when teeth are normal in shape, position, and time, they are never complete in length and shape of the root, nor are they complete until long after the crowns have been entirely exposed and put into use. This incompleteness consists in the root being short and funnel-shaped instead of pointed. The large end is directed into the tissues about them and is sharp like a gun-wad punch. This is true of all human teeth. The molars may be compared to a thimble, with the sharp lower edge pushed into the soft embryonic tissue when pressure is brought to bear upon them. At this age of life bone tissue is comparatively soft and incomplete. This is especially true of the face and jaws. On the other hand, long before a tooth is erupted the enamel is hard and complete, and the enamel organ has disappeared save for its remnant in the form of Nasmyth's membrane as a film over the outside surface of the crown. The enamel at this time is practically as hard as it ever will be, and its edges are thin and sharp. The formation of dentine is upon the inside of this enamel cap, and its incomplete edges are also sharp until the apices of the roots are formed. And this does not normally occur even in the incisors of the milk set until about the fifteenth or eighteenth month after birth, the last of the milk set not being completed until the twentieth to the twenty-fourth month. In the

permanent set the first to mature are the first molars about the ninth year. The last of the permanent teeth are not completed until near the twentieth year. Thus it is seen that at all times between the ages of one and a half and twenty years there are from four to twenty teeth in a good condition to produce irritation of all degrees. Between the ages of six and fourteen there is the greatest number, and it is between these ages that the disease under discussion most frequently appears. To produce irritation, it is only necessary to have sufficient pressure or a stroke hard enough to force one of these uncompleted teeth into the tissues below them, and this may easily occur when a tooth is far enough developed to have penetrated the bone above its crown, and yet not to have perforated the flesh. At this age the only real attachment the tooth has is a narrow ring of the root just below the finished edge of the enamel. This attachment is often not wider than a sixteenth or an eighth of an inch. As the tissues below it are soft, the bone not having formed, excepting a slight ring at the neck to which the thick, elastic peridental membrane is adherent, it is evident that this attachment could easily be ruptured by downward pressure. This lateral attachment will, of course, be greater after the tooth has erupted, but then the facilities for injury are also increased because the crowns protrude and are being used. Pressure upon the teeth and alveolar ridge from mastication is brought to bear many times a day, and it is easy to imagine that inflammation once started may be so continuous that the surrounding embryonic tissues could be excited into the production of new growths of a connective-tissue nature. From continuity of tissue it would seem perfectly easy for the dental follicle of the neighboring tooth to become inflamed from irritation of one that has erupted."

These explanations are good so far as they go, but they fall short of the real explanation of the cause of the failure of the tooth to erupt. Rhachitis has been given as the possible cause of the failure of the teeth to form perfectly and erupt. Analysis of the reported cases would seem to give some strength to this view, because many of the teeth found in these cysts are imperfect so far as the roots are concerned. Since the cementum, which completes the roots, is very similar in its

nature to bone, one can readily see how a failure of bone products in rhachitis might have a very important bearing upon the retention of the teeth. In order to test this idea, sections of the various teeth taken from cysts of this character have been made, but the results failed to show any uniformity in regard to the amount and character of the deposit of cementum. This would seem to negative the idea that the increasing deposit of cementum is what causes the tooth to erupt.

The real question in the pathology of this infection hinges upon the non-eruption of the tooth. It is not difficult to conceive how a retained tooth will produce irritation, but there does seem to be great obscurity in regard to the causes which produce the eruption of the tooth.

Theoretically, cysts of epithelium and of connective-tissue formation should be found, the former arising from the enamel organ and the latter from the tooth follicle. Various observers have corroborated this theoretical prophecy and have classified the cysts accordingly.

Sutton says, "Histologically, an epithelial odontome consists of branching and anastomosing columns of epithelium, portions of which form alveoli, the cells occupying the alveoli varying, the outer layer being columnar while the central cells degenerate and give rise to a tissue resembling the stratum intermedium of an enamel organ. They probably arise from persistent portions of the epithelium of enamel organs."

Mr. Baker (Transactions of Tenth International Congress of Medicine, Band v, Abtheilung 14, p. 103) reports a case with cysts attached to the palatine and posterior buccal roots of a left, upper, first molar tooth.

"The one on the posterior buccal root exhibited the usual structure of these growths, viz., an outer, thicker layer of fibrous tissue with elongated cells evidently derived from the root membrane, a middle layer consisting of rounded, enucleated cells arranged in irregular rows with a felted arrangement of fibres between, and an internal layer of granulation tissue in which

some thin-walled blood-vessels were to be seen, and in the centre of the granulation tissue a cavity which contained a small quantity of pus. None of the sections exhibited epithelium. It was therefore purely of mesoblastic origin. The other cyst was similar in composition to the former one, except that 'on the granulation tissue stood a double row of *columnar, ciliated* epithelium.' "

This observation is entirely at variance with all others, with the exception of one reported by Dr. Rothman. The almost universal opinion is that epithelium is not found in cysts connected with the roots of the teeth.

Mr. Eve (*British Medical Journal*, 1883) holds that the epithelial lining of such cysts may be due to an ingrowth from the epithelium of the gum.

The recognition of the real nature of these growths rests very largely upon the following four points: First, absence of a permanent tooth after it should have been erupted, without any history of its removal. Second, the cystic nature of the growth. Third, the crackling sensation of the thin bony cyst wall when pressed upon. Fourth, exploratory incision.

The development of a cyst at or near the time for the eruption of a permanent tooth may be of value in diagnosis, as may also the slow increase and painless development of the neoplasm. "Crackling" is by no means a constant symptom, and is inferior in diagnostic import to tapping or incision. In any case of cyst connected with either jaw, incision of the mass should precede excision of a part or all of the jaw. This conservative measure does not interfere with the radical one, and may frequently obviate any mutilating procedure.

The prognosis is uniformly good both as to the life of the individual and from an æsthetic point of view.

The evacuation of the cyst, removal of the tooth, thorough curetting of the interior, with subsequent packing of the cyst cavity, is the proper procedure in all cysts connected with the teeth. This mode of attack will certainly remove the growth as well as the cause of it. Cysts in connection with the teeth

never require removal of osseous structures in order to bring about a cure. Of course, one can imagine the implantation of a malignant growth upon one that was originally benign, but the literature on the subject does not record an example of such transformation.

EXCISION OF THE CLAVICLE.

BY H. BEECKMAN DELATOUR, M.D.,

OF BROOKLYN, N. Y.,

Surgeon to Long Island College Hospital, St. John's Hospital, and Norwegian Hospital.

EITHER partial or complete excision of the clavicle is done for tumor, necrosis, compound fracture, and for exuberant callus.

At first thought, bearing in mind the anatomical relations of the bone, it would appear that its entire removal would render the arm of that side useless, but as a matter of fact this is not true, as is well shown in my cases.

CASE I.—*Sarcoma of the Clavicle*.—A. H., thirty-seven years of age, was admitted to the Long Island College Hospital on July 20, 1896. He gave the following history: About May, 1894, while wrestling, he injured the left clavicle. Three months later a tumor appeared about the middle third of the bone, and from then on steadily grew, without much pain, until November 18, 1895, when it suddenly ruptured while he was walking on the street. The hæmorrhage was very profuse; an ambulance from the E. D. Hospital was summoned, and he was removed to that hospital. On the following day the tumor was removed. The hæmorrhage during the operation was very severe, and it was with difficulty that it was controlled. He made a slow recovery. Four months later he noticed a return of the growth. This has been steady and painless. On admission to the hospital he says the tumor has the appearance and is about the size it was just before it ruptured on previous occasion. At the site of the middle clavicle was a mass about the size of a hen's egg, the skin over it was purple and very tense. The growth was firmly attached to the clavicle and painless on pressure. The movement of the upper extremity was not restricted by its presence.

On July 21, 1896, after due preparation, the patient was placed under an anæsthetic and an incision made from the tip of the acromion process to the middle of the suprasternal notch; at its middle it encircled the growth. By careful dissection the

growth was freed from the structures of the neck and the entire length of the clavicle exposed. A chain-saw was then passed around the bone internal to the mass and the bone divided. The outer portion of the clavicle, together with the tumor, was then dissected away. The inner fragment was then seized with bone forceps, and with scalpel and scissors carefully disarticulated. This was the most difficult part of the operation on account of the close proximity of the left subclavian vein and also the thoracic duct. No enlarged glands were found. The wound was sutured with interrupted silkworm gut and a small drain of iodoform gauze introduced. The amount of blood lost was not very great; duration of operation forty minutes.

Recovery was rapid. The wound healed by primary union except at the site of drainage. The patient was able to be about on the sixth day, and by the end of the week was able to move the arm to a limited extent. At the end of six weeks movements of the arm were complete, and strength rapidly returned. Within three months he returned to his work as porter in a rubber factory, and has since done the same class of work as previous to the operation. Thirty-three months after the operation there was no evidence of return. The pathological report on the tumor removed was osteosarcoma.

CASE II.—*Sarcoma of Clavicle*.—M. D., Irish, aged twenty years, domestic, was referred to me by Dr. Rankin. For two months she had suffered from severe neuralgia in the right arm and shoulder. This was soon followed by swelling of the arm and shoulder. The pain had become very great and patient was unable to get any relief.

Examination showed the arm swollen and a swelling about the clavicle which extended into the neck from the posterior surface of that bone. Pressure on this tumor increased the pain in the arm. There was no projection anteriorly.

Operation, May 15, 1897. Incision from acromion to middle of sternal notch. The clavicle was exposed for its entire length. Disarticulation of the acromial end was the next step, and then lifting up the bone it was separated from the underlying structures until the inner end was reached, and then scissors were employed to divide the sternoclavicular ligaments, and complete removal of the bone was effected. The extension of the growth into the neck required quite extensive dissection along the vessels and nerves

and the removal of a portion of the apex of the pleura. The opening thus made in the pleura was sutured with catgut. The skin was sutured with interrupted silkworm gut and a small drain of iodoform gauze introduced. The patient made an uneventful recovery, and on June 22, 1897, was discharged from the hospital, having at that time complete use of the arm.

This case never reported further to us, and inquiry at the address given failed to find her.

The report of the pathological findings by Dr. J. M. Van Cott was osteosarcoma.

CASE III.—*Sarcoma of Clavicle, Sternum, and First Rib.*—D. W. P., aged fifty-five years, Irish, longshoreman; also referred by Dr. Rankin. Admitted August 10, 1897. Patient ascribes his trouble to an injury received three months since. He first noticed a small growth about two months ago; this has grown very rapidly, and has been quite painful, especially on abduction of the bone.

Examination reveals a hard, nodular tumor on the upper surface of the clavicle at the sternal end. Skin over it is not changed. Pressure on the tumor increases the pain, which radiates into the neck and back of head.

August 14, 1897. Incision into the tumor showed it to have started in the sternal end of the clavicle and to have the gross appearance of sarcoma. Complete extirpation of the clavicle was determined upon, and was done as described in Case II. After removal of the clavicle, the growth was found to have invaded the sternum and first rib also. A chain-saw was then passed around the first rib just internal to the vessels, and the bone divided. Then with the finger behind the sternum, so as to protect the soft structures, a Hey's saw was used to divide the sternum from the left sternoclavicular articulation to the second chondrosternal articulation. This allowed of the removal of a triangular portion of the sternum and the inner third of the first rib, the sections of bone having been made in apparently healthy tissue. Several enlarged glands were removed from the anterior mediastinum.

The wound was closed except for a small point at the outer angle for drainage. Duration of operation, forty-five minutes.

There was considerable discharge for a number of days and the sinus was slow in closing, the patient not being discharged for

six weeks. At this time he had complete use of the arm. Pathological report was sarcoma.

On December 7, 1897, the patient was again admitted to the hospital suffering with a fracture of the base of the skull, from which he died on the second day. There was no evidence of return of the growth.

The most remarkable thing in these cases is the complete functional result obtained and the short time it takes for it to develop. While the operation ordinarily is not technically difficult, one must always bear in mind the close anatomical relations of the clavicle to the vessels and nerves of the upper extremity, and at the sternal end the innominate artery on the right side, and the thoracic duct on the left. In our experience, it is much less difficult to begin by disarticulation of the bone at the acromial extremity, as the field is free and parts well exposed, while trying to liberate the sternal end.

There have been reported only forty cases of complete excision, with a mortality of seven, or about 18 per cent.

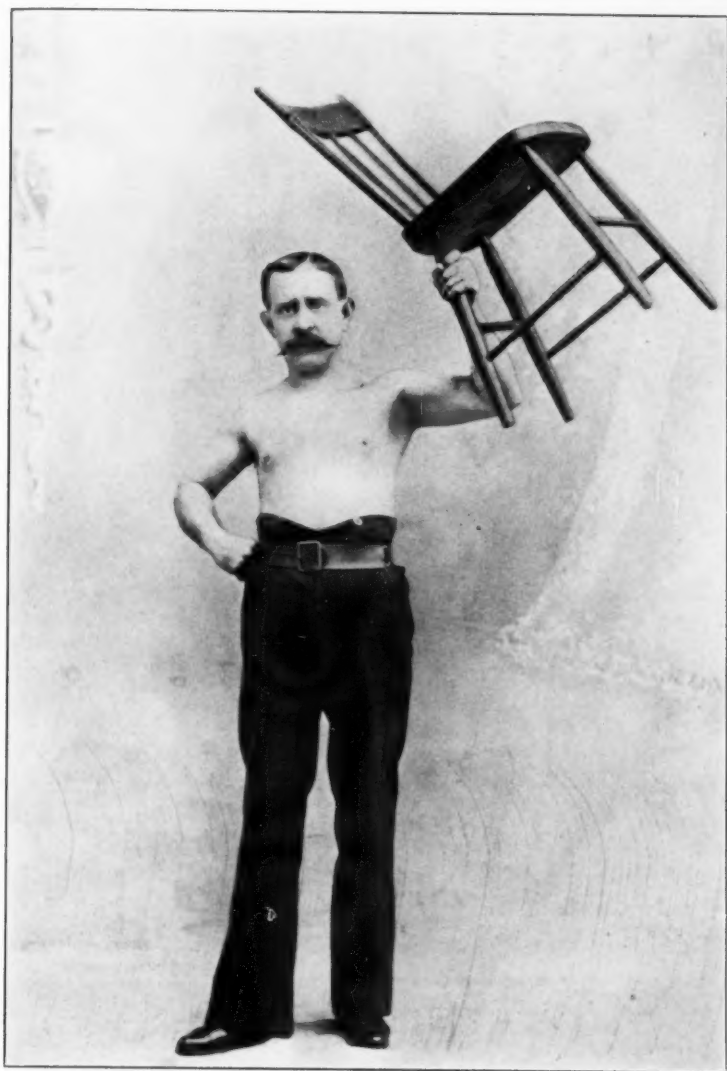
Of incomplete excision for various conditions, there have been about 100, with a mortality of 14 per cent.

We have to report two cases of partial excision with one death. In the fatal case, a portion of the clavicle was excised to facilitate ligation of the subclavian vessels in a case of aneurism. In this case death was the result of acute anæmia.

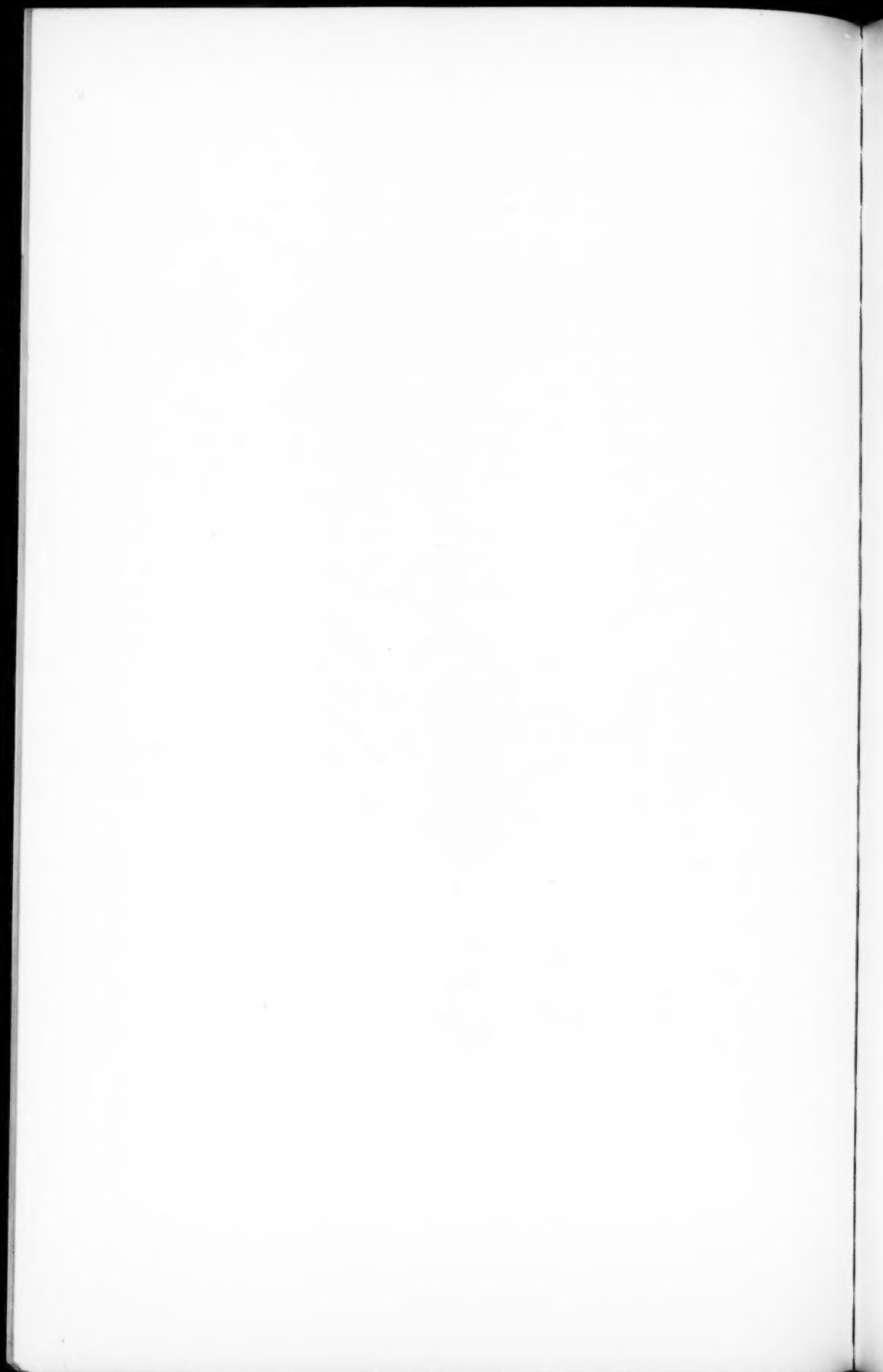
CASE IV.—*Exuberant Callus at Site of Fracture of Clavicle.*
—Male, aged forty years. Applied for treatment at the Norwegian Hospital because of severe pains in the left upper extremity. He had been unable to sleep for a couple of weeks, and had not been free of pain for several weeks. Two months before he was caught in a hole by the dirt caving in, and a fracture of the left clavicle resulted.

Examination showed marked over-riding of the fragments and a large mass of callus projecting from the posterior surface of the clavicle. There was marked atrophy of the muscles of arm and partially of hand.

After consultation with Dr. Wm. Browning, it was decided



Eight weeks after operation, showing strength of arm after complete removal of the clavicle.



that the pain was due to pressure of the callus on the brachial plexus, and that the best treatment would be to remove the middle third of the bone. An incision was made over the mass and the surrounding structures dissected away. A chain-saw was passed around the bone at either side of the mass and the bone cut through. The mass was then removed and the wound closed without drainage. Wound healed by primary union. The pain was completely relieved. After two weeks the patient was able to use the arm as well as ever, and a marked improvement in the atrophied muscles was evident. It has not been possible to trace this case since discharge.

OSTEOMA OF THE KNEE-JOINT.¹

BY R. TUNSTALL TAYLOR, M.D.,

OF BALTIMORE,

Surgeon in Charge of the Hospital for Crippled Children; Clinical Professor of
Orthopaedic Surgery, University of Maryland.

I WISH at this time to report the following case as being of especial interest and unusual, from the very large size of the osteoma found, to emphasize the great importance of the skiagraph in making diagnosis possible in such cases, and in pointing out the proper mode of treatment.

Such a case could have been painted with iodine, worn elastic stockings and various braces, had massage and electricity indefinitely without cure. Nothing short of the radical removal of such a partially loose body in the knee-joint could afford relief.

I do not consider that there is any more danger in opening the knee-joint even for exploration than in opening any serous or synovial cavity elsewhere, but the most scrupulous technique in asepsis is necessary to insure success, of course.

CASE.—J. H., aged nineteen years, presented herself for treatment. Her family history was negative, and her past history had no bearing on the present trouble.

Her present trouble began four years ago, when in stepping from the street to the pavement her foot caught on the curb and her right knee gave way, bending backward violently. Rising, she went to school, whither she was bound, and thought no more about it, until after sitting for some time she started to rise, when she found she was unable to straighten her knee and could bear no weight on that leg. She was carried home, and could not use her leg for four weeks, when it gradually improved until she was able to bear her weight upon it again, but motion in the knee-joint

¹ Read before the American Orthopaedic Association, June 5, 1902.

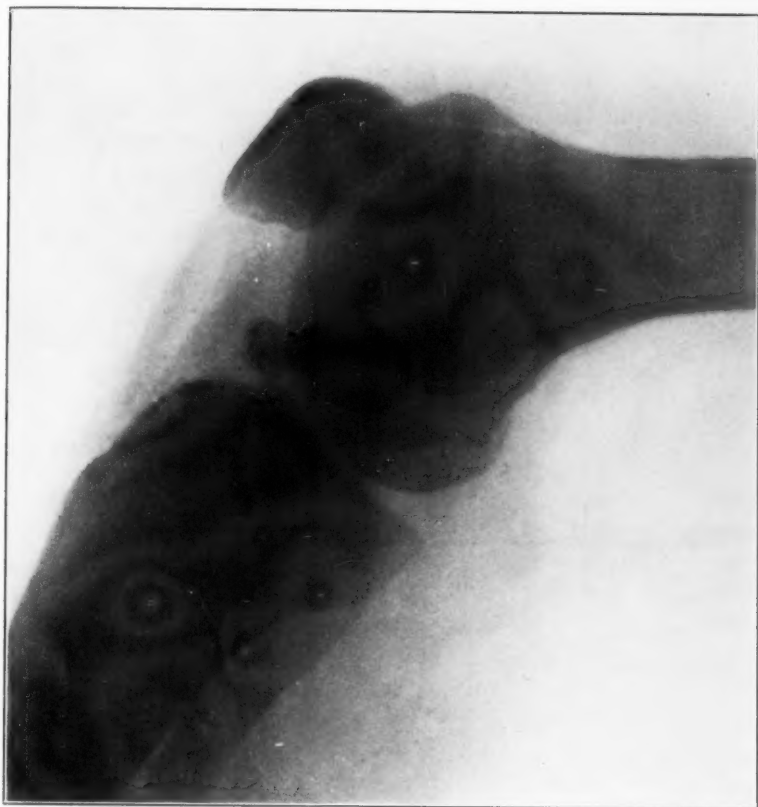
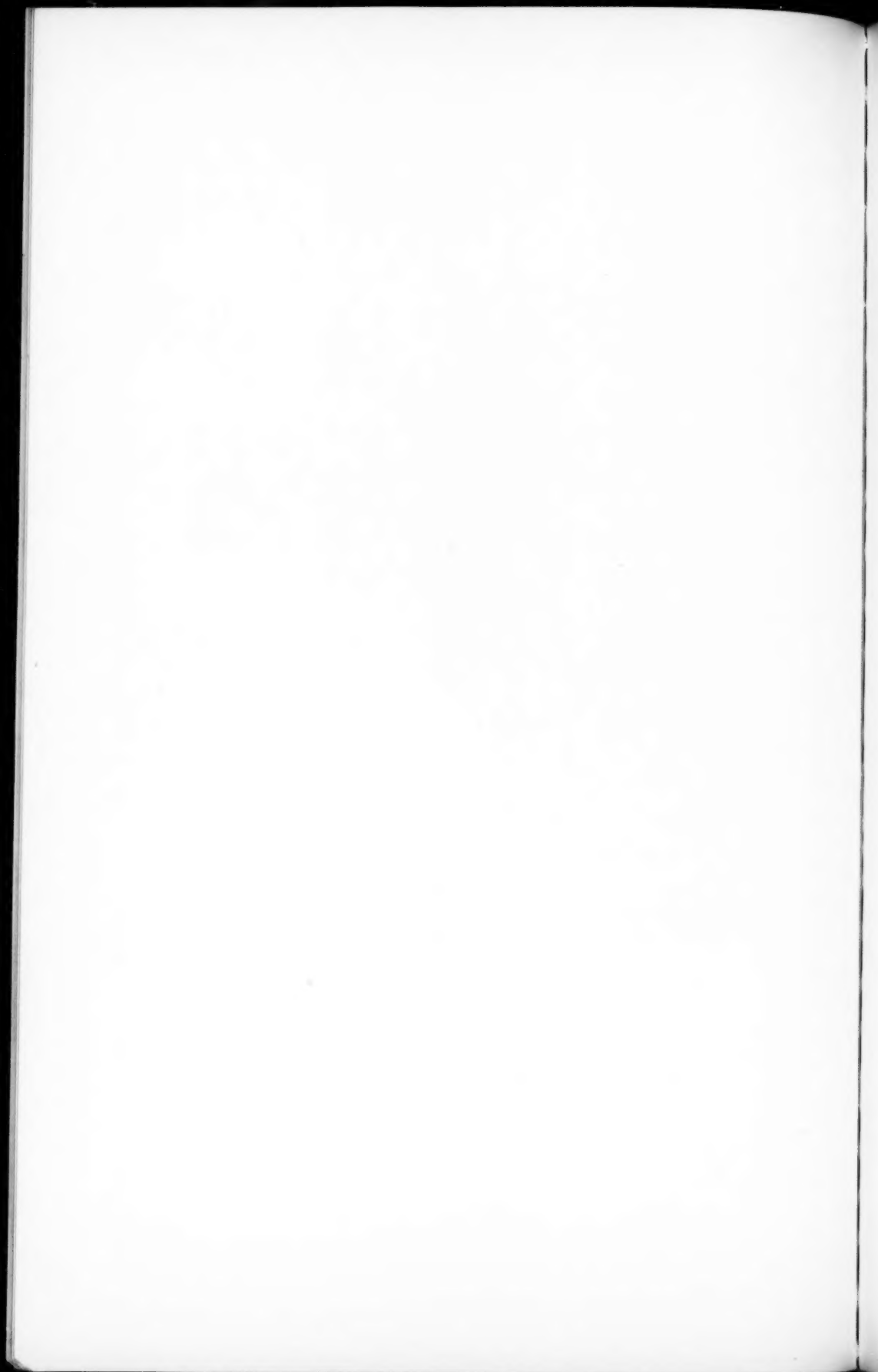


FIG. 1.—Osteoma in knee-joint attached to crucial ligament; bone probably developed from internal intercondyloid tubercle, which was torn loose from tibia at time of accident.



remained permanently limited to 150 degrees in extension. The joint was at first slightly swollen and quite painful, aching and throbbing. Atrophy at, above, and below the knee was present when she came to me. A point of maximum tenderness was just under the patellar ligament. There was at no time any constitutional disturbance. The patient had been treated for two years for rheumatism and had local massage. She did not improve under this treatment. In October, 1901, she consulted me. Operation was then advised, but static electricity and massage were tried for three months. The knee was made more comfortable under this treatment, but motion in joint did not become any more free, and tenosynovitis was constantly present over the quadriceps and patella tendons.

Three X-ray pictures of the joint were taken and showed a foreign body in joint, which projected from and into the intercondylar notch, and which the X-ray stereoscope showed was apparently attached to and nearer the external side of the internal condyle. (Fig. 1.)

January 15, 1902. Under ether, an incision, about four inches (twelve centimetres) in length, was made on inner side of the knee-joint. When the capsule was opened, a foreign body was seen occupying a position between the condyles, as shown in the skiagraphs. This body at first appeared to be the size of a small marble on looking in the joint, and was movable. On further examination the body was found to project into the intercondylar notch; it was attached above to the under surface of the patella by the plica patellaris synovialis, and on its medial side to the internal condyle. After several attempts, it was found to be impossible to remove the body through the inner incision without considerable trauma to the joint, so that a counter-incision was made on the outer side and the joint exposed as on the inner side. The foreign body was then grasped by long forceps on the inner side, being pushed from the outer, and its attachments loosened with a curved scissors; it was situated outside of the synovial membrane, but surrounded by a reduplication of this membrane and attached to the under surface of the patella by the plica patellæ synovialis. The body, or osteoma, when removed was much larger than it appeared to be on looking in the joint, as the largest part of it was within the intercondylar notch, and hence its difficulty in removal. Its size is (one by one and a half

inches) three by five centimetres in length and breadth and (two inches) seven centimetres in circumference. It was pyriform; its free surface was trochlear in shape and smooth like the articulating surface of a bone (Fig. 2). There was a small sesamoid bone attached by a ligamentous band to the posterior extremity of this large osteoma. This ligamentous band was evidently the anterior crucial ligament which had been torn loose from its tibial attachment, and in it the osteoma developed. The capsule and skin incisions were closed by silver-wire sutures (continuous and subcutaneous respectively), and the wound dressed with silver foil and gauze. From toe to groin the leg was encased in plaster of Paris in full extension, which was now possible for the first time.

January 16. Patient's temperature rose to 101.5° F. as the maximum evening temperature.

January 17. Maximum temperature (9 P.M.) was 100° F.

January 20. Dressings changed. Wound healed per primam. Sutures not removed. Temperature has not been above normal since January 17.

January 27. Sutures removed. Motion free and full extension possible.

February 5. Massage given daily.

February 9. Patient discharged well, with perfect use and function.

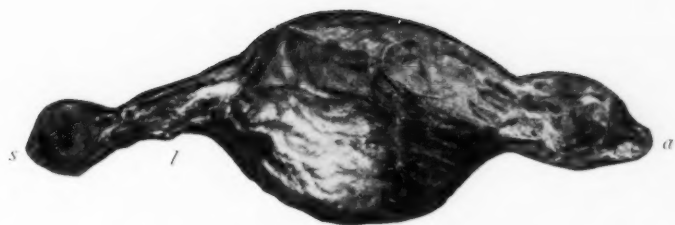


FIG. 2.—Osteoma from the knee-joint. *a*, Anterior extremity; *l*, remains of crucial ligament; *s*, sesamoid bone.



POSTERIOR DISLOCATION OF THE HEAD OF THE TIBIA.

WITH THE REPORT OF THREE CASES.

BY JOHN G. SHELDON, M.D.,
OF TELLURIDE, COLORADO.

CASE I.—A teamster, thirty-four years of age, in attempting to stop a team of horses, was so brought in contact with a rapidly moving truck that the hub of one of the front wheels struck him on the anterior surface of the leg just below the knee. He was felled to the ground, but retained consciousness. After sustaining the injury, he found that his right knee was fixed in the extended position, and that it was painful.

Examination, two hours after the accident occurred, showed a complete posterior dislocation of the head of the right tibia. The femur and tibia overlapped each other about two inches. No skin wound was present. The swelling was moderate; evidences of extravasation of blood were slight, and the circulation in the leg did not seem affected. Under general anæsthesia, the dislocation was easily reduced by extension and by direct manipulation of the tibia and femur. Forty-eight hours after the injury occurred, the patient was very comfortable. Very little swelling and discoloration were present, and the foot and leg were warm. Twelve hours later—sixty hours after the knee was injured—the extremity was cold and livid to the knee. Evidences of gangrene followed shortly, and the next day the thigh was amputated in its lower third.

CASE II.—A miner, forty-one years of age, while rapidly descending a steep incline, stepped into a crevice between the rocks. His leg was held firmly, and his body was thrown forward violently. Examination showed a complete posterior dislocation of the head of the tibia, compounded on the inner side posteriorly. The swelling was moderate, and the circulation did not seem impaired. Reduction was done under general anæsthesia. Everything went well till the fourth day, when the extremity became pale and cold to a point above the knee. Evidences of gangrene were soon manifest, and a thigh amputation was done.

CASE III.—Through the kindness of Dr. John B. Murphy, of Chicago, I am permitted to report this case, which came under Dr. Murphy's observation in 1881.

A curb-flag, which had been left standing on end by the stone-cutter, fell against the patient's knee. The injury therefrom was a complete posterior dislocation of the tibia, complicated by a small flesh wound posteriorly. The dislocation was reduced. On the third day following the accident, gangrene was manifest. The gangrene extended to the knee. The patient died two or three days later, five or six days after the accident occurred.

On looking up the literature of posterior dislocation of the head of the tibia, I find that the case reports do not correspond with some of the statements made in the ordinary text-books of surgery. In the "International Text-Book of Surgery," Vol. i, p. 638, the idea is conveyed that posterior dislocations of the head of the tibia are usually incomplete. Of the fifty-two cases that I can find records, thirty-seven were complete and only fifteen incomplete. The three cases herewith reported were also complete dislocations. Another statement that I have read—though not bearing directly on the subject—ought to be mentioned. In Park's "Surgery," condensed edition, p. 616, it is stated that injury to the popliteal vessels is more apt to occur in anterior dislocations than in the posterior variety. According to the records of reported cases, injury to the popliteal vessels and gangrene occur more frequently in the posterior displacements. One writer states that the popliteal notch on the posterior surface of the femur protects the popliteal vessels in anterior dislocations of the tibial head, while no such notch or depression is present on the dorsal surface of the tibial head to offer protection in posterior dislocations of the knee.

Posterior dislocation of the head of the tibia is a rare condition. I have been able to find reports of only fifty-two cases. Some of them were published as early as 1787. In 1894, Cramer, in his inaugural dissertation at Wurzburg, discussed the condition, but his list of cases is far from complete.

Only two cases have occurred in the patients treated in Cook County Hospital, Chicago.

Posterior dislocations of the head of the tibia may be produced by direct or indirect violence. The injury in the fifty-two cases that I have records of, and in the three herewith reported, was produced in the following ways:

In four cases the dislocation was produced by the leg being held in a fixed position while the remainder of the body was thrown violently forward. In all of these cases the dislocation was complete. One case was compounded and gangrene followed.

In sixteen cases the accident consisted of a fall. Ten of these were complete and six were incomplete. Two were followed by gangrene. None was compounded.

Six cases resulted from entanglement in machinery. In three the dislocations were complete. A compound dislocation was present in one case. Gangrene occurred in two of them.

In three cases no cause for the dislocation was given. Only one of these was complete. Compounding or gangrene was not present in any of them.

In four cases the dislocation resulted from the patients being felled to the ground by falling or moving bodies. Three of these were complete; one was compounded, and gangrene occurred in one.

Direct force, applied to the lower and posterior aspect of the thigh, was responsible for the dislocation in seven cases. Six of these were complete, two were compounded, and gangrene occurred in one.

The most serious injuries resulted from the direct application of force to the anterior surface of the leg or to the knee. In fifteen cases the dislocation occurred in this manner. Ten of these were complete; three were compounded, and gangrene occurred in three of them.

Previous diseases or injuries were not mentioned in any case as predisposing to the dislocation. The patients were

all in perfect health at the time of the injury. Two cases only occurred in women.

In forty cases of the fifty-five reported, the dislocation was complete. Seven of the forty complete cases were compounded, and in nine of these gangrene occurred. Of the fifteen incomplete cases, only one was compounded, and in only one did gangrene occur.

Total number of cases, 55.

Complete dislocations, 40.

Complete compound dislocations, 7.

Complete dislocations, with gangrene, 9.

Incomplete dislocations, 15.

Incomplete simple dislocations, 14.

Incomplete compound dislocations, 1.

Incomplete dislocations, with gangrene, 1.

Total number of compound dislocations, 8.

Total number of dislocations with gangrene, 10.

The only feature in the symptomatology diagnosis or prognosis of posterior dislocations of the knee that I shall discuss is gangrene. This condition occurred in ten cases. In nine of these the dislocations were complete, and in only one was it incomplete. The occurrence of gangrene does not seem to bear any direct relation to the external evidences of injury to the tissues. In seven of the gangrenous cases the dislocations were not compounded; while in five compound dislocations no gangrene complicated. A reliable prognosis cannot be given on making an examination shortly after the occurrence of the accident. Another misleading feature in these cases—from a prognostic stand-point—is the fact that the first evidence of gangrene, or of impaired circulation in the injured member, may not be manifest for some hours or days after the injury. The impairment of the circulation may be indicated, at the time of the injury, by a very feeble posterior tibial pulse. (Vast's and Wagner's cases.) Usually there is no indication of impaired circulation till the third day, then the leg becomes cold and gangrene rapidly supervenes. These changes may come on as early as the

second day or as late as the fourteenth. It is stated in the "International Text-Book of Surgery," Vol. i, p. 639, that gangrene may occur three or four weeks after the injury. I can find no record of cases of this character.

In most cases the gangrene extended to the knee. In one case it extended slightly above the knee; and in Reisinger's case the line of demarcation was found at the middle of the leg seven weeks after the dislocation had occurred.

AN APPARATUS TO FACILITATE THE APPLICATION OF PLASTER JACKETS DURING SPINAL HYPEREXTENSION.

BY ERASMUS DARWIN FENNER, M.D.,

OF NEW ORLEANS,

First Assistant Surgeon to the Charity Hospital; Lecturer on Diseases of Children in Tulane University.

THE introduction of the plaster jacket in the treatment of spinal disease by Sayre marked an epoch in orthopædic therapeutics. Nothing more efficient or more universally applicable has since been discovered. But from the beginning there have been obvious objections to his method of suspension in putting on the jacket. In patients of all ages the strain on the neck is painful and fatiguing, and in young children, who are the very ones for whom a jacket is most often needed, the pain and fright are accompanied by struggling and screaming, which are not only embarrassing to the surgeon, but frequently oblige him to take the child down before the plaster is thoroughly hardened. To escape these annoyances, efforts were made to devise a satisfactory method of applying the plaster in the recumbent position. Hammocks of cloth, tightly stretched upon an iron or wooden frame, upon which the child was laid, were used by some, but were never widely adopted because it was impossible to prevent a certain amount of sagging as soon as the child's weight was imposed upon the cloth.

The teaching of Calot in 1897, who recommended the immediate, forcible rectification of the deformity of Pott's disease, gave a new impulse to the treatment of this disorder. Up to that time the "practical ideal" of the orthopædic surgeon had been to prevent an increase of existing deformity,—an ideal which, by the way, was seldom realized. The idea of *correction* was now introduced, and surgeons all over the world began to submit patients to Calot's method. Accumu-

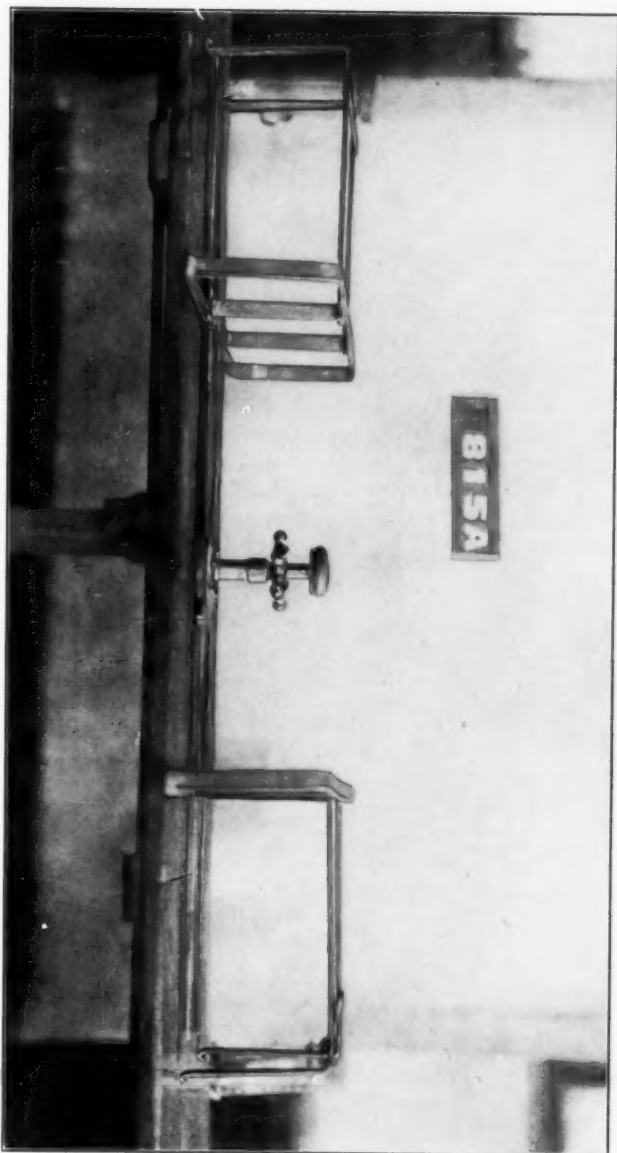


FIG. 1.—Dr. J. D. Bloom's apparatus, showing extreme recession of jack-screw. The iron frames on which rest the pelvis and shoulders are made more comfortable by having a square of card-board laid upon them.

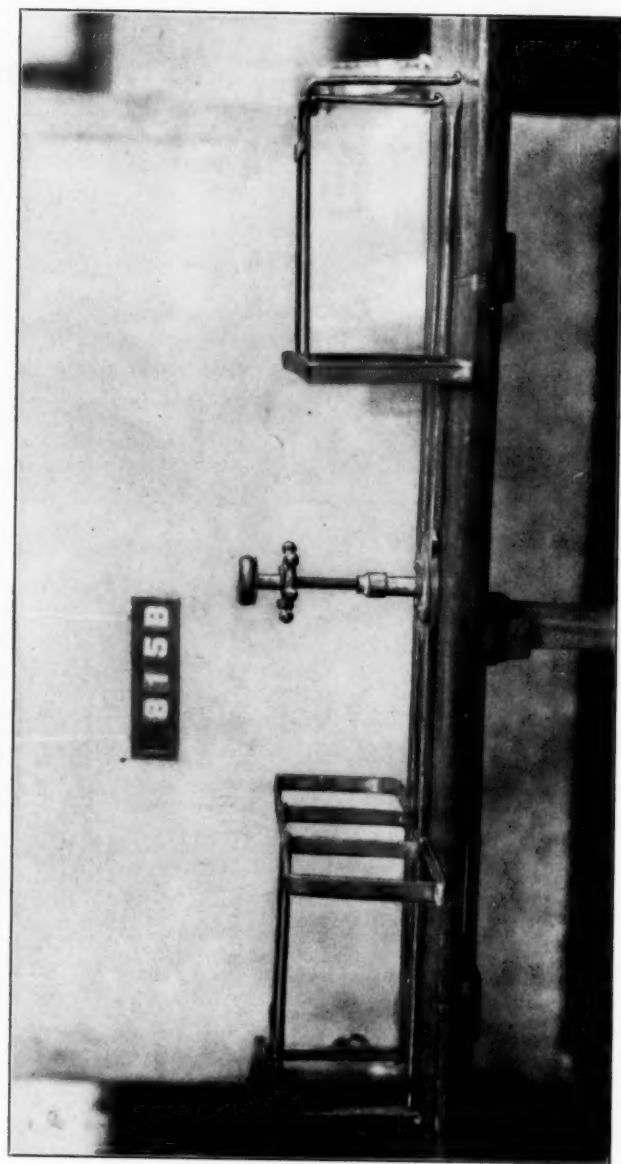


FIG. 2.—Dr. J. D. Bloom's apparatus, showing extreme extension of jackscrew.

lated experience has resulted in the abandonment of this radical procedure, and in its place have been adopted methods aiming at the gentle, gradual correction of the deformity by hyperextension, and the application of the corset in this position. The most widely used appliance for this purpose has been the Goldthwaite frame and its modifications, figured in Whitman's "Orthopædic Surgery," and in routine use at the New York Hospital for the Ruptured and Crippled. This is an excellent method. It tends to a gradual and painless correction of the deformity; it permits the application of the jacket in the recumbent posture, and the patient lies comfortably on the frame until the plaster is thoroughly dry. I have used it frequently and with satisfaction. Until the apparatus devised by Dr. J. D. Bloom, of the New Orleans Charity Hospital, was constructed, I considered the Goldthwaite frame the best method of applying plaster corsets. The superior merits of Dr. Bloom's apparatus are, however, so apparent, that it has but to be seen to be appreciated, and to be used once to be adopted for good and all. It combines cheapness, durability, simplicity, and efficiency. And it can be used for adult patients with as much satisfaction as for children.

The accompanying illustrations exhibit so clearly the construction of the apparatus that little can be added by way of description. The important feature of the apparatus is the *jack-screw*, which is placed directly beneath the knuckle of the deformity. This has for a base a broad, heavy disk of iron, from which rises a column of ordinary gas-pipe with an internal thread, in which plays a smaller pipe with external thread. A ring with suitable knobs is introduced to facilitate the extension and recession of the screw. A metal disk, *loosely* attached to the top of the screw, so as to permit its independent movement, is surmounted by a solid rubber ring pessary, which prevents painful pressure upon the spinous processes. The iron frames at either end support the shoulders and the pelvis, and are made more comfortable by laying a square of heavy pasteboard across them, and a little padding such as a folded sheet or cotton batting. These frames and

the jack-screw are connected by two iron bars, which play in slots in the base of the jack-screw and frames, and may be fixed by suitable thumb-screws, and which are pulled out when the patient is to be removed from the apparatus.

Upon this appliance the patient lies securely and comfortably. The screw is placed directly under the deformity, the spinous processes having been previously protected by felling, and the screw is gradually lifted, gently overcoming the muscular contraction and extending the spinal column at the site of the deformity. When the maximum of extension has been obtained, the jacket is applied, leaving an opening behind where the body rests against the ring, and where pressure by the corset often requires that a fenestrum be made. After the corset is dry, this weak spot can be reinforced by the application of a supplementary plaster bandage. After a rather extended experience in plaster work, I confidently assert that nothing so practical or efficient as this apparatus has up to this time been called to my attention.

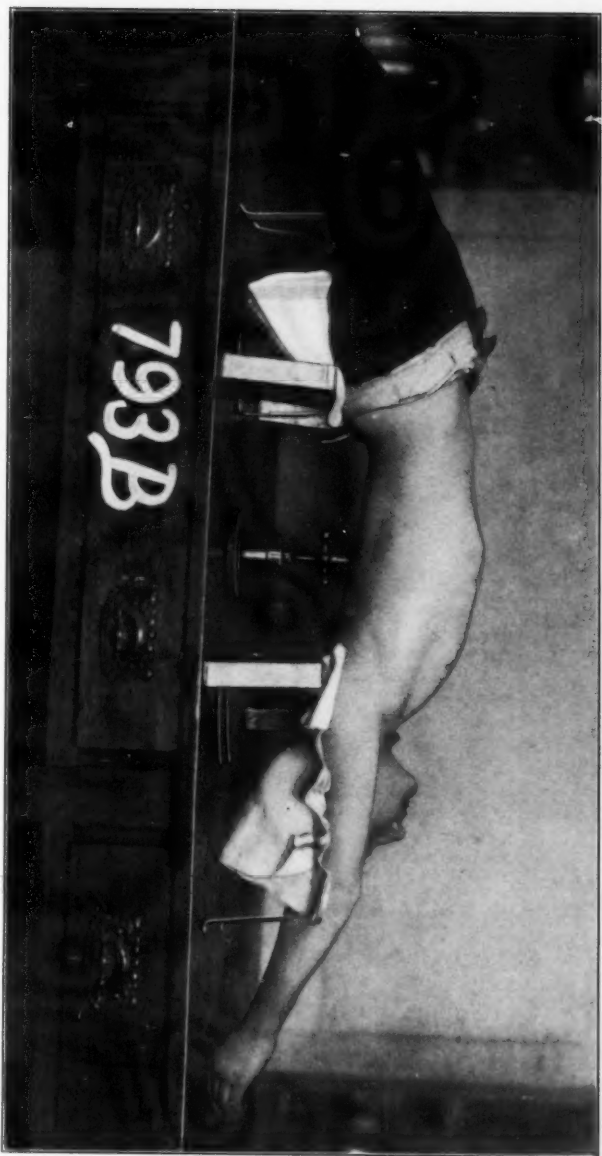
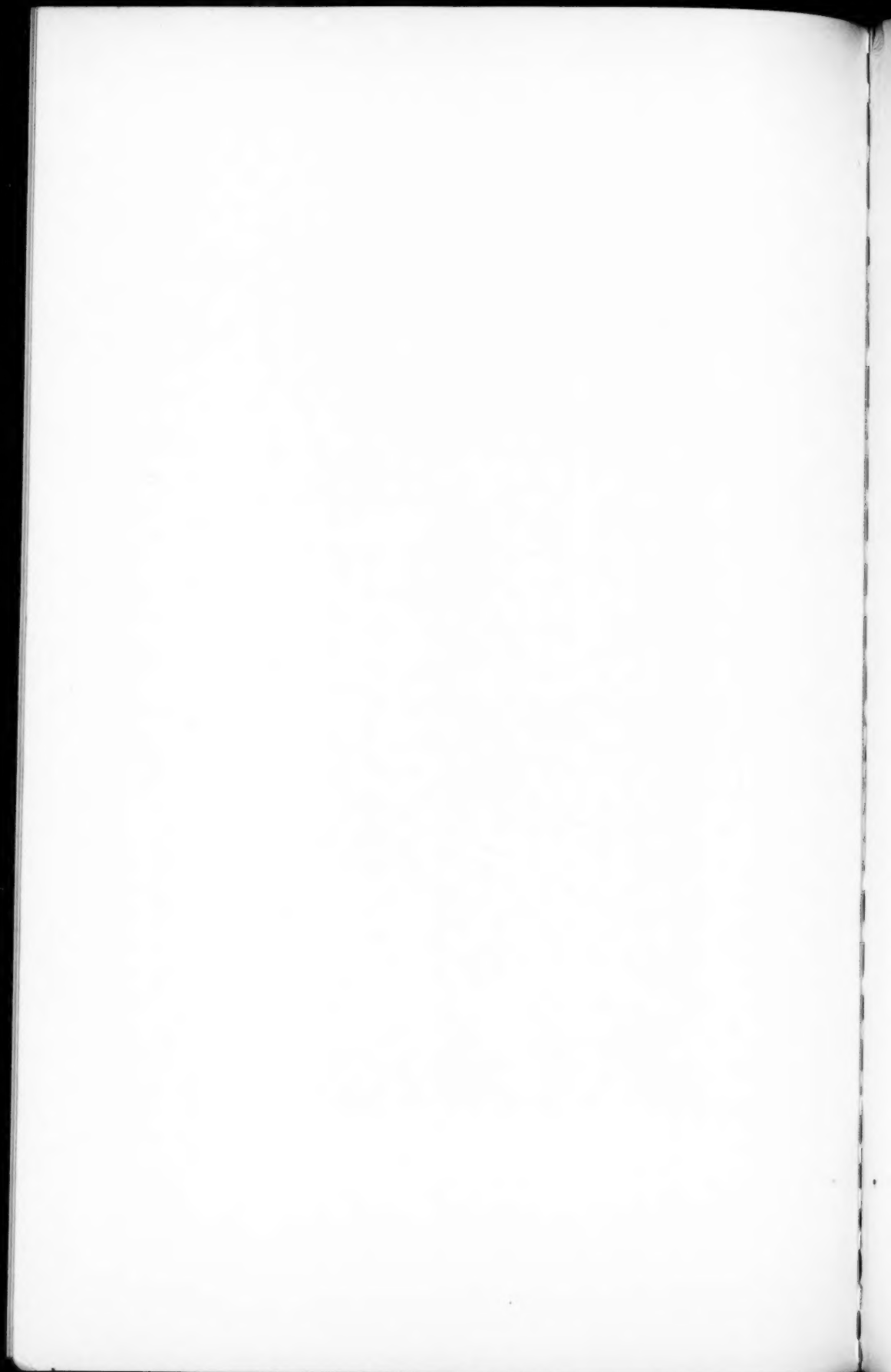


FIG. 3.—Dr. J. D. Bloom's apparatus in use. In this picture the frames to support the shoulders and pelvis are an earlier model, not so good as the ones shown in the other illustrations.



TRANSACTIONS

OF THE

NEW YORK SURGICAL SOCIETY.

Stated Meeting, October 22, 1902.

The Vice-President, HOWARD LILIENTHAL, M.D., in the Chair.

FLAIL-JOINT AFTER EXCISION OF ELBOW-JOINT.

DR. ROBERT H. M. DAWBARN presented an old case of excision of the elbow-joint, seen by him during his recent service at the City Hospital. The patient presents the worst possible result, —a "flail-joint." The insertion of the triceps was evidently sacrificed; and in consequence the patient is unable to extend the forearm with any degree of force whatever. Regarding the rarity of "flail-joint" after excision, Dr. Dawbarn said that this was the first he had seen, in twenty-one years' experience, that deserved to be called by so extreme a name. He recalled the fact that the late Dr. Henry B. Sands had remarked that he had never had but one case of "flail-joint" from elbow-excision, though several with partial lack of complete freedom of motion.

In the present case, by a very considerable shortening of the length of the limb, a more nearly normal joint might be secured, together with a reinsertion for the triceps muscle. However, he was inclined to advise the use of a rectangular wooden or felt splint, fitted to his arm and forearm, and fastened by straps and buckles above and below; and that he should thus, by making a fixed point of the elbow, at an angle permitting him to feed himself, be enabled to gain a much better use of the muscle of the forearm than is now possible.

DR. GEORGE D. STEWART said the patient exhibited by Dr. Dawbarn was operated on at Bellevue Hospital during his service there. The man was sent to Bellevue from the almshouse, suffering from an untreated fracture of the right humerus, about four inches above the elbow-joint. At least two inches of the upper

fragment protruded through the skin and had necrosed. This was cut away, and the arm was put up in a proper splint. While the wound was granulating, the man, while out on a pass, became intoxicated and disappeared. Some months later he became engaged in a brawl, and was brought back to the hospital as a prisoner. Upon examination, a refracture of the humerus was made out, and subsequently the entire lower fragment of the bone was found to be necrotic. This section of dead bone was pried out with a periosteal elevator. The upper extremities of the corresponding radius and ulna were also necrotic, and the articulation was entirely destroyed.

As a matter of fact, therefore, Dr. Stewart said, no resection of the elbow-joint was even attempted in this case, but simply the removal of necrosed bone. He still presents evidences of a necrotic process going on in the ends of the involved bones, so that, instead of having had too much bone removed, there was really not enough removed.

THYROGLOSSAL DERMOID.

DR. GEORGE E. BREWER presented a negress, aged thirty-five years, who first noticed a lump under the middle of the lower jaw on May 5 last. It grew rapidly but without pain until the middle of June, when she presented herself for treatment at the Roosevelt Hospital. On admission, she presented a large oval painless tumor between the symphysis of the jaw and the hyoid bone. The mouth was widely open, the tongue was lifted to the roof of the mouth, and there was constant salivation. For the previous few days swallowing was impossible except for fluids, and there was some embarrassment of the respiration.

Under chloroform anesthesia, a median incision was made over the most prominent portion of the tumor, and the muscles separated until the white glistening capsule was reached, which was found to be between the geniohyoid muscles. The tumor was easily separated from its attachment, but could not be delivered through the opening thus made. The mouth was then widely opened and the floor of the mouth exposed by cheek retractors. A semilunar incision was made through the mucous membrane, along the alveolar border, and the floor of the mouth retracted backward. The tumor was then separated from its attachments by the finger introduced from above and below, but it seemed

impossible to deliver it through the mouth. It was thought that it would be necessary to saw through the jaw, but before resorting to this procedure, another attempt was made to push it outward through the mouth. This was finally rendered possible by forcing the jaws widely apart with the heavy screw mouth-gag.

The mucous membrane was sutured with catgut and the external wound united with silkworm gut. Recovery was uneventful. The tumor was oval, and measured seven inches in circumference.

DR. JOHN F. ERDMANN reported a case of thyroglossal dermoid in which the growth was considerably larger than the one shown by Dr. Brewer, and which he succeeded in removing, with much difficulty, through the floor of the mouth. The operation was rendered more difficult by the fact that the man could not be kept under an anæsthetic, and on account of adhesions resulting from an operation which had been done through the submental region a year previous. The patient made a perfect recovery.

RUPTURE OF THE KIDNEY.

DR. GEORGE E. BREWER presented a negro boy, four years of age, who was admitted to Roosevelt Hospital in August last, a short time after receiving a contusion of the left flank and abdomen, caused by falling down a flight of stairs. There was comparatively little evidence of shock; so little, in fact, that the child fell asleep soon after the injury, and the parents did not consider the question of seeking medical advice until it was noticed that the boy passed bloody urine.

On examination, there was found only a slight tenderness over the left lumbar region. There was no evidence of free fluid in the peritoneal cavity, and no rigidity of the abdominal muscles. The child had not vomited, and made no complaint unless handled.

A diagnosis of severe contusion or rupture of the kidney was made, and the child immediately prepared for operation. Under chloroform anæsthesia, an oblique lumbar incision was made, exposing the kidney, which was found surrounded by a large mass of clotted and fluid blood, having a decidedly urinous odor.

When the kidney was exposed, a transverse fissure was found at the junction of the upper with the middle third of the organ.

The fissure extended from the external border to the hilum, freely opening into the pelvis. In fact, the upper segment was only attached to the lower portion of the kidney by a narrow pedicle. The parts were thoroughly disinfected with peroxide of hydrogen and salt solution, and the upper segment replaced against the lower and sutured with catgut. The external wound was united, with drainage, and the dressings applied.

The child reacted well from the operation. The hæmaturia ceased at the end of twenty-four hours, and recovery was uneventful.

EXTRAPERITONEAL RUPTURE OF THE BLADDER COMPLICATING FRACTURE OF THE PELVIS.

DR. BREWER presented a man, aged twenty-five years, who was brought to the hospital in a state of severe shock after a crushing injury to the region of the pelvis inflicted by being rolled between a car and a brick wall. He complained of great pain about the pelvis, which was accentuated by any movement of the trunk or legs; he also had a strong desire to urinate. On examination, there was observed mobility and crepitus, easily appreciated whenever the iliac crests or other portions of the pelvis were moved. Tenderness was well marked in the hypogastric region, and a semisolid tumor was appreciated just above the pubic symphysis.

On catheterization, the bladder was found to contain only a small amount of bloody fluid; previous spontaneous efforts at urination had been ineffectual.

The pulse was rapid and weak, the temperature subnormal, the patient was apathetic, and could give no intelligent account of the accident. He was immediately prepared for operation. Under ether anæsthesia an incision was made in the median line, just below the umbilicus, and the peritoneal cavity opened for purposes of exploration. Through this incision it was easily demonstrated that there was no intraperitoneal rupture, but that there was an enormous hæmatoma of the prevesical space, extending more to the right than the left side. The abdominal wound was immediately closed, and the prevesical space opened by an extension downward of the original incision. A large amount of clotted blood was found and removed, after which the hæmorrhage from the deeper portions of the wound was very free,

necessitating immediate packing and the administration of a large intravenous saline infusion and other stimulating measures.

As soon as the hæmorrhage was controlled, further examination revealed a transverse fracture of the horizontal ramus of the pubis on the right side, one fragment of which was directed inward, and lay within the cavity of the bladder, passing through a ragged tear in its anterior wall, which extended well downward to the prostatic portion. The displaced fragment of bone was forced back into position and sutured to its fellow by heavy chromicized catgut; the tear in the anterior wall of the bladder was sutured with two or three layers of catgut, and a small opening for drainage was made at the summit of the bladder. These procedures were extremely difficult to carry out, especially the suturing of the deeper portion of the bladder wound, and consumed considerable time. It was the original intention to establish perineal drainage, as there was evidence of injury to the deep urethra and triangular ligament; but before this could be done, the condition of the patient became so critical that the operation had to be abandoned, the wound was hastily packed, and the patient placed in bed. Several infusions were given and every known method of stimulation resorted to in order to save his life. He remained in a condition of severe shock for many hours and then slowly improved. The wound became badly infected in spite of constant irrigation and frequent dressings. Several days later he was again etherized and a perineal opening made into the urethra, through which the bladder was drained; another drainage tube was passed from the perineal wound upward through the triangular ligament above the prostate, to drain the foul prevesical space. These tubes were left in place for several weeks, until the wound was clean, and until the suprapubic bladder wound, which had sloughed extensively, was beginning to close. They were then removed, and the perineal opening was allowed to heal. Sounds were passed to preserve the patency of the urethra.

The suprapubic opening, however, persisted, owing to its large extent, and as a result a condition of contraction of the bladder gradually developed. The urethra recontracted and the passage of sounds became more and more difficult. A second external urethrotomy was performed, and the bladder drained

for several weeks, in the hope that the fistula would close. This was finally abandoned and the perineal wound allowed to heal.

Efforts were then made to dilate the bladder by injecting each day as much boric acid solution through a catheter as the organ would hold, egress of the fluid through the suprapubic wound being prevented by digital compression. By this means the bladder capacity was increased in thirty days from one and a half ounces to five and a half ounces. He was then discharged and told to report once a week for sounding, in the hope that the suprapubic fistula would heal spontaneously.

During his absence from the hospital, the bladder became badly infected, and he developed a pyelitis on the right side. Sudden plugging of the upper extremity by a calculus caused an acute attack of pyonephritis, which brought him back to the hospital. On admission, his temperature was 104° F.; pulse, 130. He was suffering from a severe, aching pain in the right flank, which was the seat of a large oval tumor.

Nephrotomy was immediately performed, and about twenty ounces of pus and an obstructing ureteral calculus removed.

Two months later a plastic operation was performed on the suprapubic opening, which narrowed it to the size of a darning-needle. Later it closed, and, with the exception of a contracted bladder, the patient is now in excellent health.

SARCOMA OF THE FEMUR.

DR. WILLIAM B. COLEY presented a man, aged nineteen years, who first noticed a swelling in the lower portion of the left femur in November, 1901. This gradually increased in size, accompanied by loss of weight and deterioration of general health. The patient came under his observation February 5, 1902. At this time physical examination showed a large tumor extending from the condyles of the left femur to the junction of the middle and upper thirds. The tumor consisted of a fusiform enlargement of the entire lower two-thirds of the femur; on the outer aspect of the thigh, about one and a half inches above the joint, there was a soft, fluctuating area, just covered by thin and reddened skin. There was a slight impairment of the functions of the joint, but no swelling of the joint itself. An incision was made under cocaine into the fluctuating area and three ounces of clear serum, similar to that which is found in cystic degeneration of sarcomatous

tissue, were evacuated. The curette was passed into the cavity of the bone and typical sarcomatous tissue removed. Microscopic examination, by Dr. E. K. Dunham, showed it to be round-celled sarcoma. The patient absolutely refused operation, although he was told this was the only thing that offered any hope of saving his life. The X-ray treatment was tried entirely as an experiment, with the result that the tumor decreased one inch in circumference. After a month's treatment the exposures were discontinued for two weeks, at the end of which time the tumor had increased nearly an inch in size. The treatment was again resumed and the growth slowly decreased in size, until at the end of another month the circumference of the thigh over the centre of the tumor was one inch less than the original measurement.

The treatment has been continued from February up to the present time, *i.e.*, nearly nine months, although it had to be discontinued for a month on account of a very severe general eczema, starting in the region exposed to the rays and spreading over the entire body. At the present time, the circumference of the thigh over the most protuberant part of the tumor is only half as great again as that over a corresponding portion of the normal side. The bronchial trouble which existed in June, and which led Dr. Coley to suspect metastases, has cleared up, and the patient has gained twenty pounds in weight.

During the month in which no treatment was given, the leg showed a decided increase in size. With regard to the question as to whether or not the improvement will continue until entire absorption has taken place, Dr. Coley stated that this is, of course, impossible to determine as yet. The fact that one of the most malignant types of growth, a periosteal round-celled sarcoma of the femur, has not only been held in check for nine months, but has nearly disappeared, is in itself a very important fact.

RECURRENT MALIGNANT GROWTH IN THE AXILLA.

DR. W. B. COLEY presented a lad, sixteen years of age, with a negative family history, who had enjoyed good health up to the fall of 1901. At that time he noticed in the left axilla a small, hard, painless nodule, about the size of a hazel-nut, slightly movable. It steadily increased in size until his admission to the

Methodist Episcopal Hospital, in the service of Dr. Lewis S. Pilcher, in April, 1902. At that time physical examination showed a swelling in the left axilla and pectoral region somewhat larger than a goose egg, slightly tender and movable on the deeper parts. The skin was movable over it, and there was marked involvement of the axillary contents.

Operation, April 9, 1902. The history states that a curved incision was made over the tumor mass, along the anterior border of the axilla. The axilla was found filled with hard and enlarged glands, varying in size from that of a bean to a pigeon's egg, some of these glands being closely adherent to the great vessels of the axilla. The pectoralis major was divided, and all palpable glands dissected out. The muscle was reunited with chromic gut sutures.

Shortly after leaving the hospital, the growth recurred locally, and the patient was referred to Dr. Coley for treatment, as an inoperable case, on June 20, 1902. Physical examination at that time showed a hard mass, about three by four inches in size, apparently beneath and involving the pectoral muscle and extending to the border of the axilla, rather firmly fixed to the surrounding structures, with all the clinical characteristics of recurrent sarcoma. The patient was admitted to Dr. Coley's service at the General Memorial Hospital, and since July 1 has undergone X-ray treatment, the frequency of the exposures varying from three to four times a week. They were of ten minutes' duration and given at a distance of ten inches. The growth soon showed improvement, which continued steadily until the last of August, at which time the tumor had entirely disappeared. He then developed a slight attack of pneumonia, on account of which the treatment was discontinued for about three weeks. Since the middle of September he has had out-patient treatment, receiving three to four X-ray exposures a week up to the present time. The treatment is continued with a view to preventing a further recurrence, if possible.

MISPLACED TESTIS.

DR. JOHN ROGERS presented a young man who gave the history of a tumor in the right inguinal region, existing from birth, with all the signs of a simple reducible hernia, excepting that it extended upward beneath the skin on the surface of the external oblique muscle, parallel to Poupart's ligament. At the apex of the

mass was the testicle. The right side of the scrotum was empty; the left testicle was in its normal position. At the operation, five weeks ago, the hernia was found to occupy the curious position described above, and to be of the typical congenital inguinal variety with the testicle at the apex of the sac, opposite the right anterior superior spine of the ilium, on the outer surface of the external oblique. An ordinary Bassini operation was performed, and the testicle, which appeared to be normal, was placed in a pocket made in the scrotum. Healing was uneventful. The interest in this case lies in the rarity of the testicular misplacement.

SARCOMA OF THE VERTEBRA.

DR. ROGERS presented a man, twenty-two years old, who began to have pain in the small of his back in 1899. He was treated by various physicians for tuberculosis of the spine, and finally had a plaster jacket applied by Dr. Gibney in 1901. This was worn for a year or more. In February, 1902, a tumor was discovered occupying and involving the spinal lumbar region. A section from the mass was taken and examined, and reported upon by Dr. H. Brooks as a typical giant-celled sarcoma. Signs of paralysis appeared early in 1902, and rapidly increased. Injections of pure erysipelas toxins were begun in February, and continued until May, when they were discontinued, as the reaction was violent and the patient in a very reduced condition. There was complete motor and sensory paralysis below the waist, incontinence of urine and feces, and a bad cystitis. Altogether, the patient was in a very pitiable and apparently hopeless condition. A month or two later improvement began to occur, and steadily progressed until now (October, 1902) nearly all the distressing symptoms have disappeared. There is still the large tumor in the back, which has only slightly decreased in size, and some little cystitis, with a night frequency of five or six urinations. But the patient, instead of being a bed-ridden paralytic, is able to sit up and walk about.

SARCOMA OF THE HIP-JOINT.

DR. ROGERS presented a woman, twenty-six years of age, who complained of pain in the left hip for several weeks in April, 1898. The pain grew slowly more acute until one day she fell and sustained a fracture of the neck of the femur. She was taken

to Mt. Sinai Hospital and treated in a Buck extension apparatus until discharged cured in July, 1898. She went home, and got about with tolerable comfort, but a couple of months later broke the same hip again in the same place by such trifling violence that the fracture might properly be called spontaneous. She was taken again to Mt. Sinai Hospital, and the evidences of tumor were then so marked that Dr. Gerster considered her case inoperable, and merely removed a section of the growth from the region of the great trochanter. The hospital pathologist reported large spindle-celled sarcoma. The wound apparently failed to unite. She was given the erysipelas toxins at this hospital for three months, apparently without improvement, and was finally sent as a hopeless case to the Montefiore Home in August, 1899. After this she received no more injections of toxins. Dr. Rogers found her in the following year with a large, hard tumor occupying the region of the hip-joint and upper part of the femur, and with a suppurating sinus leading into the largely hypertrophied great trochanter from the outer aspect of the thigh. The bone was united throughout. The leg had a limited range of motion, but the patient was unable to walk on account of the pain it induced. During the next two years repeated attempts were made to close the sinus, and success was finally obtained by Dr. Elsberg, last summer, by injections of a paraffin-iodoform mixture. At each operation the sections examined showed only granulation tissue. During the years she was at the Montefiore Home, and after the injections of the toxins were discontinued, the tumefaction gradually disappeared, until now the condition is like an ordinary case of the fracture of the neck of the femur which has healed with considerable shortening. She can walk with comfort, and is in all respects well. To add to the perplexity and interest in this, is the fact that a year and a half or two years ago she had a sore throat of long duration, and for the past year has been complaining of her nose, and about a month ago she was discovered to have a typical syphilitic perforating ulcer of the nasal septum. She has never until the last week had any antisyphilitic treatment.

DR. WILLIAM B. COLEY said that because this patient, at some considerable period subsequent, had developed a syphilitic ulcer of the nasal septum, it was not necessary to draw the inference that the growth involving the upper portion of the femur, which had been pronounced a sarcoma by a competent pathologist,

was also syphilitic. Both syphilis and sarcoma may exist in the same patient coincidently or at different times. In a case which came under the speaker's observation in 1893, the patient had an inoperable spindle-celled sarcoma of the abdominal wall, which was successfully treated by means of the erysipelas toxins. Seven years later, this patient developed a typical primary syphilitic lesion on the penis, followed by the usual secondary symptoms of syphilis. In this case the two diseases had no bearing on each other, and the same was probably also true in Dr. Rogers's case.

DR. ROGERS said that an interesting feature in connection with this case was that no improvement in the condition of the hip was noticed until at least six months after the toxin treatment had been discontinued. She had never received any specific medication. The speaker said it was not difficult to conceive that the tumor in the hip could have disappeared spontaneously if it was of syphilitic origin, and suppurated as this did. On the other hand, reports of some cases of sarcoma treated by toxins of erysipelas seem to show that improvement may not take place for at least weeks, but may then begin and continue whether the toxins are continued or not.

DR. COLEY referred to one case in which the fact mentioned by Dr. Rogers was demonstrated very clearly. The case was one of very large recurrent, inoperable, spindle-celled sarcoma involving the thigh and buttocks. The patient was treated about two months with the mixed toxins at the Post-Graduate Hospital in 1894. There was some decrease in size, but progress was so slow the patient became discouraged and left the hospital. Subsequently, the tumor slowly continued to disappear, and now, eight years later, the patient still remains perfectly free from recurrence.

In reply to a question as to whether he knew of any cases of undoubted syphilis which were treated by the toxins, Dr. Coley said that Dr. Robert H. Greene (*Medical News*, October 10, 1896), of this city, has reported ten cases of syphilis treated by this method. Some of them showed decided improvement, while others did not improve at all. The speaker said that in one case of his own where he treated tertiary syphilitic lesions by means of the erysipelas toxins there was no resulting benefit.

TUBERCULOSIS OF THE INTESTINE.

DR. JOSEPH A. BLAKE presented a woman who had entered Roosevelt Hospital in July, 1902. For ten months she had complained of right-sided abdominal pain, and a movable tender mass had been made out in the right iliac fossa. There were no other enteric symptoms. The mass had been regarded by one consultant as a movable kidney. A probable diagnosis of tubercular disease in the neighborhood of the cæcum or chronic appendicitis was made. Operation consisted of an incision, four and one-half inches long, at the border of the right rectus. The tumor was found to consist of a mass of caseous glands at the ileocolic junction, which were firmly adherent to the gut, the process evidently involving it. The cæcum and a short portion of the ileum were excised, the end of the ascending colon turned in, and the end of the ileum united to the colon laterally by means of a Murphy button. Convalescence was uneventful until the twenty-second day after operation. She then complained of severe pain in the left lumbar region, and the following day in the right lumbar region. Both kidneys became enlarged, and were extremely sensitive. Her urine was acid and loaded with pus. There was marked prostration. The temperature rose rapidly, and on the second day of the attack reached 107° F. It continued high, in the neighborhood of 104° , for several days, and finally became normal in ten days, all her symptoms clearing up under the administration of urotropin. The bacteriological examinations of the urine showed only the smegma bacillus. The pathological examination of the specimen removed showed tuberculosis of the glands and infiltration of the wall of the gut, but no tuberculosis of the mucosa of the cæcum or appendix. Evidently there was some tubercular focus elsewhere, probably in the ileum.

The patient has not wholly recovered her strength, but has gained considerable weight and is much improved since the operation, which functionally seems to have been a success.

THE IMPLANTATION OF SILVER FILIGREE FOR THE CLOSURE OF LARGE HERNIAL APERTURES.

DR. WILLY MEYER presented two patients upon whom large hernial apertures had been closed with the assistance of plates of

silver wire filigree. These cases are described in full in the *ANNALS OF SURGERY* for November, 1902, pages 773 and 775.

RESULT OF AN OPERATION FOR TALIPES CALCANEUS.

DR. ROYAL WHITMAN presented a boy upon whom he had operated for talipes calcaneus of paralytic origin. In this variety of club-foot the resulting disability is very marked; the patient's weight rests on the heel, and the remainder of the foot becomes merely an appendage.

The operation recommended for these cases is to remove the astragalus, to remove the cartilage from the bones, to implant the peronei tendons into the atrophied tendo Achillis, or, in the more recent operation, into the os calcis itself, and finally to displace the foot backward upon the leg. The most important part of the operation is the removal of the astragalus, on which the foot is perched. As in most instances the foot is drawn towards a valgus attitude, the transplantation of the peronei tendons not only supplies a certain power of extension, but it removes a distorting force as well.

The result of the operation in the case shown by Dr. Whitman was excellent. The boy has now a solid foot upon which to rest his weight, and the power to move it. He still wears an apparatus, which he will probably be able to discard at the end of a year.

Dr. Whitman said he had performed this operation about twenty times. In the last five cases the tendons were implanted directly through the os calcis.

SOME OBSERVATIONS ON THE DIAGNOSIS AND TREATMENT OF ABDOMINAL CONTUSIONS.

DR. GEORGE EMERSON BREWER read a paper with the above title, for which see the *ANNALS OF SURGERY* for February, 1903.

DR. ROBERT F. WEIR said that in cases of severe abdominal contusion, the surgeon must act promptly and at the same time thoroughly. The speaker said he could corroborate Dr. Brewer's statement as to the marked collapse that occurs as soon as the intra-abdominal pressure is relieved; he attributed the collapse to this fact, rather than to the handling of the abdominal viscera, which, from the difficulty in locating the seat of the injury, a

considerable amount of such handling is often unavoidable. He referred to a case where the left lobe of the liver was so severely injured that it had to be removed; the case resulted fatally, although the patient lived for several days.

In regard to the diagnosis of these cases, Dr. Weir said that, like Dr. Brewer, he felt that the greatest importance should be assigned to the rigidity of the abdominal wall. The condition of these patients is often much worse than their first appearance would lead one to suspect. He has seen ambulant patients with a laceration of the spleen or kidney or other grave lesion. This is, of course, but temporary, graver symptoms generally developing within a comparatively short period thereafter.

DR. BENJAMIN T. TILTON mentioned a case of contusion of the pancreas produced by a blow upon the abdomen, in which there were severe shock and symptoms of hæmorrhage. The man was not in a condition to be operated on, and lived only a few hours. The post-mortem showed a complete transverse rupture of the pancreas right through the centre of the organ, as though it had been cut. There was a large hæmorrhage into the smaller peritoneal sac; some of the blood had found its way through the foramen of Winslow, and both flanks were filled with it.

DR. JOSEPH A. BLAKE said that after abdominal contusions, when muscular rigidity is present, even without or with very slight other symptoms, he has formulated the rule to open and explore the abdomen, and thus far he has not had occasion to regret his action in that respect. The muscular rigidity is present before the onset of peritonitis, and he considered it a most valuable sign.

As regards the location of the incision in these cases, it is frequently a difficult question to decide. Often the best we can do is to make an incision in the linea alba either above or below the umbilicus, and subsequently, if necessary, make a second incision. The speaker said that in a case of ruptured spleen he had been able to treat the injury through a median incision, and then the packing used to control hæmorrhage had been drawn out through a lateral wound.

DR. F. KAMMERER mentioned a case of last summer in which he was called to the hospital to operate on a typhoid patient who had suddenly shown symptoms of perforation. Upon opening the abdomen, he found that very severe hæmorrhage had taken place

from the spleen. The spleen was extirpated as quickly as possible, but the patient only survived the operation by about twelve hours.

Dr. Kammerer said he was rather surprised to hear the statement made by Dr. Brewer to the effect that the collapse became more marked immediately upon opening the abdomen in these cases. The speaker said that had not been his experience. In the case referred to above the abdominal viscera were exposed for fifteen or twenty minutes, during which time the collapse slowly increased; but there was no sudden increase when the abdomen was opened, nor had he ever noticed a sudden increase upon opening the abdomen in other cases of intra-abdominal hæmorrhage, such as extra-uterine pregnancies, for example.

Dr. Kammerer said he would hesitate to give an infusion of salt solution in these cases before finding the source of the hæmorrhage.

Dr. ELIOT said that some three or four years ago, in the Presbyterian Hospital Reports, he published the history of several interesting cases coming under this class, and at that time he emphasized the importance of some of the symptoms mentioned in Dr. Brewer's paper, notably the rigidity and local tenderness, and also the fact that these cases occasionally present themselves in an atypical form. One of the most interesting cases coming under his observation was that of a man, aged fifty years, who had met with a buffer accident, and walked into the dispensary of the Gouverneur Hospital complaining merely of abdominal pain. There was no shock, no rigidity of the abdominal muscles, and an examination elicited only tenderness on pressure in the right lower abdominal region. The man's pulse was 72; his temperature was normal. The case was regarded as one of contusion of the anterior abdominal wall. When Dr. Eliot first saw him, twenty-four hours after the accident, the tenderness above referred to still persisted. On account of the persistence of this symptom, an exploratory operation was advised, but assent was refused. The patient, twenty-four hours later, without any premonitory symptoms, died in sudden collapse. The autopsy showed a small perforation in the lower portion of the ileum.

Dr. Eliot said that while he agreed with Dr. Blake that the median incision was generally the incision of choice, yet in some instances it was preferable to open the abdomen over the point of maximum rigidity. (There is a decided advantage in dealing

with rupture of the right portion of the liver or the spleen through an incision along the outer border of the right or left rectus, respectively. In certain cases of rupture of hollow viscera, also, an incision over the maximum point of rigidity may lead most quickly and directly to the site of rupture, and thereby obviate any prolonged manipulation of the abdominal contents. This had been the speaker's experience in one case of ruptured intestine.

In cases of extraperitoneal rupture of the kidney, there is some difference of opinion as to the expediency of an immediate operation. Many surgeons favor the expectant plan of treatment, and wait for symptoms of shock or secondary infection. In three such cases which came under the speaker's observation, where the diagnosis was based upon the presence of blood in the urine and a retroperitoneal hæmatoma, the expectant plan of treatment resulted very satisfactorily, as neither shock nor secondary infection took place. This method has been recommended by several Continental surgeons. Dr. Eliot said that, according to his experience, extraperitoneal rupture of the kidney was very much more common than the intraperitoneal variety.

DR. BREWER, in closing, said his experience in the treatment of these cases had convinced him that the condition of shock was accelerated by opening the peritoneal cavity. He attributed it to the fact that the pressure upon the bleeding point is relieved when the abdomen is opened and the hæmorrhage recurs.

In reply to Dr. Eliot's remarks regarding extraperitoneal rupture of the kidney, Dr. Brewer said he had treated quite a number of these cases by the expectant method, and they had turned out very satisfactorily. The case of complete rupture of the kidney which he had shown at this meeting, however, was a good illustration of the fact that it is sometimes difficult to decide upon the gravity of the condition with which we have to deal. If that patient had been treated upon the expectant plan, it would probably have ended fatally. Furthermore, an exploratory incision in these cases is not a very serious matter.

TRANSACTIONS

OF THE

PHILADELPHIA ACADEMY OF SURGERY.

Stated Meeting, October 6, 1902.

The President, RICHARD H. HARTE, M.D., in the Chair.

INTESTINAL OBSTRUCTION BY FIBROUS BAND, A REMNANT OF MECKEL'S DIVERTICULUM, AND ADHESIONS FROM A FORMER ATTACK OF APPENDICITIS.

DR. WILLIAM J. TAYLOR reported the case of a woman, aged twenty years, who was admitted to St. Agnes's Hospital on December 21, 1901, with a history that there had been no stool for six days, and that for nearly twenty-four hours there had been vomiting, which had become fecal in character.

She gave a history of having had, a year or so ago, a somewhat similar attack, which was relieved in the course of a few days.

When she was admitted to the hospital her temperature was normal, her pulse good, and there was no marked degree of pain. There was slight abdominal distention, but no marked tympanites. The whole abdomen could be handled freely and deep pressure made all over it without giving special pain.

In view of her general good condition, the stomach was washed out, calomel was given, and several high enemata employed.

The next day, December 22, there was no improvement in her condition. She had passed a poor night, and had kept down a grain of calomel in small doses, but she had vomited several times since the stomach had been washed out.

When Dr. Taylor saw her at half-past eleven, her pulse was weak, not very rapid; the tongue was dry and coated with deep brown fur. There was no special abdominal distention, as it was soft and gave no special pain on deep palpation, and there

was only moderate tympany. She complained of great discomfort across the upper portion of the abdomen.

He opened the abdomen by a median incision and found the omentum adherent to the bladder, intestines, and to the tip of the appendix. The appendix was bound down by many adhesions, and had to be separated with great force from its attachment to the omentum. This was particularly marked at its tip. It was swollen, and showed evidence of former inflammation, but there was no evidence of recent trouble. After freeing it from the adhesions, its removal was easy. The small intestines were constricted at one point, congested, and much distended, but falling short of the appearance of a true peritonitis. The intestines were pulled out of the belly and a careful search made, when it was now found that a band was constricting the small gut. This proved to be a remnant of Meckel's diverticulum arising from the small intestine about thirty-two inches from the cæcum. It was a long cord, a remnant of the diverticulum, which completely encircled the small intestine and passed through a hole in the mesentery; it was then attached to another coil of the intestines, thus firmly binding and constricting the lumen of the gut. This was a single fibrous band one-eighth of an inch in diameter, having no mucous membrane nor lumen. It was ligated with silk and then cut away; the constriction was thus entirely relieved.

The intestine was opened at one point and its contents milked out, there being quite two large basinsfuls of fluid fæces. The opening was then sutured with silk, the abdomen was flushed out with salt solution, the intestines replaced, the omentum drawn down over them, and a large glass drainage tube introduced to the bottom of Douglas's cul-de-sac. The abdomen was closed by through-and-through silkworm-gut sutures.

Although everything in the intestines was greatly congested, there was no evidence of long-standing strangulation. The peritoneal covering of the gut was torn in two places during the manipulations.

She stood the operation fairly well, as it was long and necessarily exhausting, for the intestines were out of the abdomen for some time. Her recovery was uneventful, the wound having healed by January 15, less than four weeks.

The cause of the constriction had evidently existed for a long

time, but the strangulation was very recent. While the constriction was absolute, as far as the lumen of the bowel was concerned, it had not blocked the circulation in the bowel, and hence her general symptoms were not those of acute strangulation.

GALL-STONES IN THE COMMON DUCT.

DR. ROBERT G. LE CONTE reported the case of a man, aged thirty-four years, who was admitted to the Pennsylvania Hospital, July 9, 1902. He was a large, strong, well-developed man, although he showed evidence of having recently lost a good deal of weight, estimated by him to be between thirty and forty pounds. He had always had good health until last March, although his life had been one of constant exposure in the coal-mines. In the middle of March he was suddenly seized with excruciating pain which centred in the umbilical region, radiated across the abdomen and up the back to the right shoulder-blade, accompanied by nausea, vomiting, and marked jaundice. He has had about six such attacks during the last four months. In the intervals he has been able to go about, but has not been able to work. No gall-stones have been recovered from the stools. On admission he was free from pain, and felt better than he had at any time since the beginning of his illness. His skin was loose and icteroid; muscles flabby; heart, lungs, and urine negative; abdomen soft, not tender; no enlargement of liver or gall-bladder demonstrable. Leucocytes, 11,800; hæmoglobin, 90 per cent.; no fever. Under phosphate of soda, light diet, and rest in bed the man improved slowly, and was discharged from the hospital at his own request July 28, with the sclera still showing a slight tinge of yellow. The patient was readmitted August 1 during a severe attack of abdominal pain, with vomiting and marked jaundice. He was now quite tender over the gall-bladder region, but no enlargement of the liver or gall-bladder was discernible. The urine showed bile and a trace of albumen, with small bile-stained granular casts. The blood-count showed the leucocytes to be 10,200 and the coagulation time three minutes. The acute symptoms had somewhat subsided by the 6th of August, when, under ether anæsthesia, a four-inch incision was made in the right semi-lunar line over the region of the gall-bladder. The omentum and colon were found firmly adherent to the under surface of the liver and gall-bladder. These adhesions were broken up with some

difficulty and the gall-bladder exposed. It was found to be small, thick, and firm, and could not be brought up into the abdominal incision, so that the operation had to be carried on at a considerable depth from the surface. A longitudinal incision was made in the gall-bladder and a large number of stones, perhaps two or three hundred, of different sizes were withdrawn. They varied in size from a hickory-nut to a No. 8 shot, most of them being small. A few were dislodged from the cystic duct, and two were felt in the common duct, one at the junction of the cystic and common duct and the other about one inch farther on. The first by manipulation was pushed into the cystic duct and removed through the gall-bladder, but the second was found to be immovable. An incision was made in the common duct and this stone withdrawn, and the rent was partially closed with one catgut suture. Only such adhesions were broken up as were necessary to expose the gall-bladder and ducts, the rest being allowed to remain as a protection to the remainder of the peritoneal cavity from possible infection. A few catgut sutures attached the gall-bladder to the fascia and abdominal peritoneum. Gauze drainage was inserted to and around the rent in the common duct and a rubber drainage tube placed in the opening in the gall-bladder. The wound was then closed with silkworm-gut sutures.

The recovery was uneventful. His temperature never reached 100° F.; there was a free flow of bile on the dressing, and the stools resumed their normal color. The gauze packing about the common duct was removed in forty-eight hours, and two days later the rubber tube was taken from the gall-bladder. The stitches were removed on the eighth day and the wound found well healed. At the end of two weeks the amount of bile on the dressing was perceptibly diminished. He left the hospital, September 9, with a small sinus, which discharged, perhaps, a drachm of colored mucus in twenty-four hours. One week later he again returned to the hospital with the sinus infected and a free discharge of pus. Under treatment this speedily improved, and the sinus permanently closed in two weeks' time. During these two weeks he had one annoying symptom, viz., almost every midnight he would vomit the contents of the stomach without nausea. The vomitus consisted of food that had completed gastric digestion with a slight mixture of bile. The reporter called attention to two points in the report of this case:

First. Closure of the common duct by suture. While he advocated its closure whenever possible, he said that in some cases the duct is so rigid and thickened with inflammatory material, and perhaps also so deeply placed from the abdominal surface, that it is nearly impossible to pass sutures unless the abdominal wound is very greatly enlarged, and even then the walls of the duct may be so friable that the sutures will tear out. He thought that it did not make much difference if the incision in the duct was left open, provided the opening is well surrounded with gauze. The wound of the duct will always close before the opening in the gall-bladder has ceased to drain.

Second. In those cases where the opening is not immediately closed by sutures, should all the adhesions among the surrounding organs be broken up? When the bile-tracts are sterile, it probably makes no difference whether these adhesions are thoroughly broken up or not; but when there is a possibility of infection, it would seem that only such adhesions should be separated as are necessary to expose these parts properly, and that the remainder around the pylorus, the duodenum, and the transverse colon should be left untouched as an additional barrier to a possible general infection of the peritoneal cavity.

DR. ALLIS thought the question regarding the closure of the common duct a very pertinent one. Even if fine catgut and a very small needle be used, there is danger of infection from entering the mucous membrane when closing the duct. If the duct be thickened, as is generally the case in these instances, the incised part will be held in place by gauze without suturing.

DR. W. L. RODMAN thought that Fenger had fully demonstrated that an incision in the common duct need not be closed in all cases. So long as the bile is aseptic, closure is not necessary. Suture of the common duct is one of the most difficult tasks in surgery. This summer he saw Mr. Robson operate and close the duct with great facility. The abdominal incision was made in the right semilunar line with a curve at the upper end. With a bag under the patient's back, the liver and gall-bladder were delivered in the most perfect manner. By this method the duct was comparatively easy of access.

DR. JOHN H. GIBBON referred to a case operated upon two days previously for gangrenous cholecystitis.

The patient was a woman fifty years of age, who gave a

history of having suffered from attacks of indigestion and vomiting. She was taken ill three days before admission to the Polyclinic Hospital. At the time of admission there was palpable a tumor in the right side of the abdomen considerably below the costal border; there was marked rigidity of the abdominal wall on this side; frequent vomiting occurred; the patient's temperature was 102° F.; and the leucocyte count made the morning after her admission was 37,000. The abdomen was opened at this time and some free fluid found in the gall-bladder region. The gall-bladder itself was covered by an adherent omentum, which, when removed, showed a distended and gangrenous gall-bladder. When incised, the gall-bladder was found to contain a large amount of pus possessing a very foul odor. A large stone was found firmly fixed at the mouth of the cystic duct. The mucous membrane of the entire gall-bladder was gangrenous and about one-third of all the coats near the fundus. The gall-bladder was easily separated from the liver, and when an attempt was made to pass a ligature about the cystic duct the gall-bladder separated and came away. The cystic artery bled furiously, and could not be controlled by a hæmostat, as the instrument cut through the inflamed tissues; the bleeding was then controlled by gauze packing. The patient was very ill after the operation, but recovered, and the day following the leucocyte count had dropped to 12,000, the vomiting had ceased, and the patient's bowels had moved freely. The second day the patient was in good condition, the temperature having fallen, but the leucocyte count had again gone up to 20,000.

AMPUTATION OF THE LEG DONE UNDER LOCAL ANÆSTHESIA PRODUCED BY THE INTRANEURAL INJECTION OF COCAINE.

DR. JOHN H. GIBBON, in reporting this case, referred to Crile's paper on the use of cocaine and eucaine (*Journal of American Medical Association*, February 22, 1902). Crile conducted a number of experiments upon animals in order to learn the effect of intraneural injection of cocaine and eucaine. He discovered that such injection resulted in an absolute block to both afferent and efferent impulses, and that consequently no shock resulted from operation upon the parts supplied by the nerve. These experiments were confirmed by subsequent clinical experience.

After injecting the sciatic and anterior crural nerves with a 1 per cent. solution of cocaine, he was able to perform an amputation of the leg not only without pain, but without the patient's knowledge, with only one exception in five cases. The exceptional case, hearing the saw passing through the bone, realized what was being done. Crile states that it is the afferent impulses from injury or operation which produces shock, and that these impulses are but slightly influenced by a general anæsthetic. Afferent impulses producing pain are abolished by a general anæsthetic, and those affecting vasomotor, respiratory, and cardiac mechanisms are not. Crile describes this injection of the nerves as a physiological amputation of the part. Matas has also done considerable work in this line with equally satisfactory results.

The case reported by Gibbon is that of a man fifty years of age, who was admitted to the hospital suffering from a tuberculous ankle-joint. The man was extremely thin and wasted. Because of the patient's age, his general condition, and the far advanced disease of the bones, it was thought inadvisable to attempt any other than a radical operation. The sciatic and anterior crural nerves were exposed under infiltration anæsthesia, and each nerve injected with a 1 per cent. solution of cocaine. Anæsthesia in the parts supplied by these nerves was not immediate, and, in fact, it was feared for a while that no anæsthesia would be produced, but in about eight minutes the patient experienced no pain when the ankle-joint was opened for the purpose of inspection. Prior to the operation, the patient was given a hypodermic of morphia and atropia, and during the operation one of the house staff engaged him in conversation. The amputation was quickly performed and without the patient's knowledge. Subsequent to the operation there was no evidence of shock whatever, excepting a slightly increased pulse-rate. He suffered little pain in the part after the operation, and the wounds healed promptly. The patient was discharged from the hospital about a month after the operation, showing no effects from the injection of the nerves with the cocaine solution.

DR. R. G. LE CONTE said he was present during the operation, and could corroborate the statement that there was no pain felt by the patient during the amputation. He would offer in explanation of the increased pulse-rate the fact that a perceptible quantity of cocaine had been used and absorbed. He mentioned

the case of a man, about to go on a coaching trip, from whose scalp he removed a wart after injecting a small amount of a 4 per cent. solution of cocaine. The man was greatly exhilarated thereby, and when he reached the coaching party the other members thought he was intoxicated. The stimulation of the pulse in the case under discussion might probably be due to the cocaine instead of being a nervous phenomenon.

INJURIES AT THE HIP IN AGED PERSONS.

DR. OSCAR H. ALLIS read a paper on the above subject, for which see *ANNALS OF SURGERY* for February.

DR. RICHARD H. HARTE concurred in all that Dr. Allis had said with regard to the sometimes anomalous conditions which occur about the neck of the thigh-bone after fracture. He had often been struck with the amount of pain and inability to move the joint, even after it had been at rest for a very considerable length of time. These conditions were due, as Dr. Allis had pointed out, to three or four causes: There may be a large number of spicula, which are sources of irritation and pain, and which often remain there as foreign bodies until they are absorbed and again replaced, frequently, by new growths from the periosteum, forming many of the large mass of osteophytes which are so often seen in specimens after fracture of the neck of the thigh-bone. Again, it is not an uncommon thing to have extensive inflammation started up, either of the character of a synovitis or an osteitis. Again, many of the specimens are frequently denuded of their cartilage, showing that a very extensive inflammatory process has been going on. This in one sense is responsible for a great deal of the loss of function which is so apparent in many of these joint injuries, and which is always characteristic of every joint inflammation. Where pain and inability to move the joint persist, and there is no contraindication to it, it is good surgery to open the joint and remove the end of the bone and any other irritating fragments which may be in the capsule or in relation with the fracture. Of course, this must be governed by the age and the condition of the patient.

DR. ROBERT G. LE CONTE said that one case recently under his care might possibly help bear out the statements of Dr. Allis, which he fully endorsed. The patient was a woman who one year ago fractured the neck of her right femur. Since that time

she had been perfectly helpless and had suffered great pain. She had also been for many years a great sufferer from rheumatic gout or arthritis deformans. Operation was undertaken ten months after the injury with the idea of freshening the ends of the bone and pegging them. When the femur was exposed, it was found that the neck had been almost entirely absorbed. The head showed eroded areas similar to those mentioned by Dr. Allis. The head of the bone was excised to relieve the pain. At the end of six weeks the patient was about on crutches, and continues in comparative comfort with the exception of the knee of the same side, which gives great pain on account of the arthritis deformans. The pain in the hip is absolutely relieved.

DR. W. J. TAYLOR said that the pain in these cases was probably largely due to arthritis set up by traumatism. An old lady of eighty-two had recently been under his care, but she was one of the more fortunate cases. She fell and sustained an impacted fracture of the neck of the femur, there being two and one-half inches of shortening. The X-ray shows a spicule of bone near the neck of the femur, but it is impossible to say where it came from. The patient, however, has had very little pain, and none since the first week. She remained in bed three weeks with light extension. She now walks around the house and even up and down stairs, the main difficulty resulting from the marked shortening of the affected side. No true arthritis was caused in this case, and the patient's general health has not suffered.

DR. G. G. ROSS related a case of which he had personal knowledge, that of an old lady who sustained an intracapsular fracture of the hip when she was 102 years of age. She recovered, and was able to walk afterwards with considerable ease, living until she was 106.

EDITORIAL ARTICLE.

MOYNIHAN ON RETROPERITONEAL HERNIA.¹

THIS volume contains the lectures which, as Arris and Gale lecturer, Mr. Moynihan delivered before the College of Surgeons. As he states, the subject has received less than adequate attention from English surgeons in the past. This is largely due to the supposed rarity of retroperitoneal hernia. Mr. Moynihan is emphatic that the condition is not one of exceptional rarity, from the number of cases which he has found recorded, together with some specimens hitherto undescribed in the London museums. The obscurity which has hitherto surrounded these conditions, the difficulty in dealing with them at the time of operation, the fact, as is repeatedly shown by Mr. Moynihan, that these retroperitoneal herniæ may quickly end lives hitherto absolutely healthy,—these points abundantly justify our desire to make Mr. Moynihan's accurate and exhaustive work on the subject more widely known.

The first chapter deals with the development of the intestinal canal and peritoneum, and certain of the abdominal organs.

The second gives a detailed account of the duodenal folds and fossæ, and the herniæ which are met with here.

In the third chapter we have an equally full and minute relation of the peritoneal folds and pouches in the neighborhood of the cæcum and vermiform appendix.

The fourth and fifth chapters are devoted to the intersigmoid fossa and foramen of Winslow respectively and the herniæ which may occur in each.

¹ RETROPERITONEAL HERNIA. By B. G. A. MOYNIHAN, M.S., F.R.C.S., Assistant Surgeon, Leeds General Infirmary. London: Bailliere, Tyn-dall, and Cox, 1899.

While each of these chapters is exhaustive in the way in which each subject is dealt with, it is the second which must be looked on as the most important, owing to the greater frequency of duodenal herniæ; the fourth and fifth are comparatively brief, owing to the rareness of herniæ into the intersigmoid fossa and foramen of Winslow.

THE DUODENAL FOLDS AND FOSSÆ.

Mr. Moynihan begins by clearing his ground with a reference to the redundant nomenclature adopted by various writers. The term which has been most indiscriminately and inaccurately employed is "duodenojejunal." While it must be confessed that it is a very difficult matter to find an exactly suitable term for such fossa, and while alternative titles are given in almost every instance, the one placed first in each case by Mr. Moynihan is in his opinion the aptest, and he points out that much perplexity would, in future, be avoided if that title could alone be accepted.

History of the Fossæ.—As would be expected, the chief credit of our knowledge here is given to Treitz ("Hernia Retroperitonealis," *ein Beitrag zur Geschichte der inneren Hernia*, Prag, 1857). He says, "If in a body with a normal peritoneum one lifts up the great omentum and the transverse colon, and pushes over to the right the mass of small intestines, there will be seen on the left side of the duodenojejunal flexure a peritoneal fold. This varies in shape and size. Most frequently it is semilunar, the thin concave edge looking upward and to the right (of the subject) and surrounding the bowel at the level of the flexure. The upper horn of this semilunar fold is blended with the inferior layer of the transverse mesocolon, and especially at the point where the inferior mesenteric vein passes beneath the pancreas. The larger lower horn is continuous on the inner side with the peritoneal investment of the duodenum, and at the outer end with the peritoneum of the transverse and descending colon. In the upper horn, at a variable distance from the edge, lies the inferior

mesenteric vein, forming an arch with the convexity looking upward and to the left. The lower horn is less distinct, composed exclusively of two layers of peritoneum, and, at some distance from its free border, one sees the inferior mesenteric artery and its branch, the left colic. From the relative position of these two vessels there results a vascular arch (always referred to now as the arch of Treitz) which surrounds the fold in question. Behind this peritoneal fold—between it and the duodenum—there exists necessarily a depression or pocket in the form of a funnel, the summit of which is directed towards the duodenum. The orifice of entrance is semilunar, limited on the right by the flexura duodenojejunalis; on the left by the free border of the fold. The fossa is, in general, situated on the left side of the third lumbar vertebra."

It is of practical importance to note that Waldeyer ("Hernia Retroperitonealis," Breslau, 1868) found this duodenojejunal fossa of Treitz to be present in 73 per cent. of 250 cases consecutively examined. Its size varied considerably, being sometimes capable of containing only the terminal joint of the index-finger, sometimes as much as twelve or eighteen inches of small intestine.

Folds and Fossæ.—It is pointed out that from the time of Treitz the number of duodenal fossæ discovered has been increasing. Mr. Moynihan, with much minuteness, describes the following nine:

1. *The Superior Duodenal Fossa.* 2. *The Inferior Duodenal Fossa.* 3. *The Posterior Duodenal Fossa.* 4. *The Duodenojejunal Fossa.* 5. *The Intermesocolic Fossa.* 6. *The Infraduodenal Fossa.* 7. *The Paraduodenal Fossa, or Fossa of Landzert.* 8. *The Mesentericoparietal Fossa, or Fossa of Waldeyer.* 9. *The Parajejunal Fossa of Brösike.*

Only the more practical anatomical points will be dealt with here, so that the clinical aspect of duodenal herniæ may be more fully dealt with later on.

1. *The Superior Duodenal Fossa*, or upper horn of the Fossa of Treitz (Fig. 1). This is present in from 40 to 50 per cent. of cases. It may exist alone or be present with the inferior duodenal fossa. It lies to the left of the ascending portion of the duodenum, near its termination. The orifice looks downward, opposing the mouth of the inferior duodenal fossa. The apex extends upward

FIG. 1.



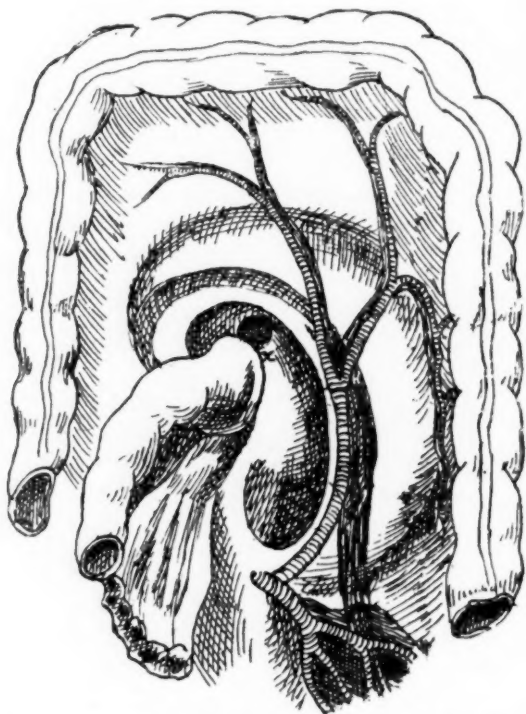
The superior and inferior duodenal folds and fossae.

to the body of the pancreas. It is bounded in front by the *superior duodenal fold*, presenting a lower free margin, whose inner end is blended with the peritoneum on the front of the duodenum; the outer being lost on the mesocolon, near the junction of the transverse and descending bowel, in front of the left kidney. The upper part of the fold is continuous with the transverse mesocolon. The line of union of the superior duodenal fold with the

descending mesocolon corresponds, as a rule, almost exactly with the inferior mesenteric vein.

2. *The Inferior Duodenal Fossa*, or Fossa of Treitz (Fig. 1). This is the most frequent of all the peritoneal fossæ found in this region. It exists, more or less well defined, in from 70 to 75 per

FIG. 2.



Paraduodenal fossa, or fossa of Landzert, and posterior duodenal fossa.

cent. of cases. In its typical form it may be thus described. It is situated on the left side of the ascending portion of the duodenum, opposite the third lumbar vertebra. The orifice looks almost directly upward, the fundus inclines downward, practically always to the right, to the root of the mesentery. The fossa is bounded in front by the *inferior duodenal fold*. The upper margin of this

is sharp: its inner end is lost on the anterior surface of the duodenum, the outer blends with the peritoneum covering the posterior wall of the abdomen. To the right of the fossa is the ascending portion of the duodenum, behind it is the parietal peritoneum covering the third lumbar vertebra. In certain cases, it is said, the inferior mesenteric vein may be found on the free edge of the orifice; when the vein takes this course, it may have the left colic artery encircling it spirally.

3. *The Posterior Duodenal Fossa*, or Fossa of Gruber (Fig. 2). This fossa was seen by Gruber (*Zur Hernia Interna*, St.

FIG. 3.



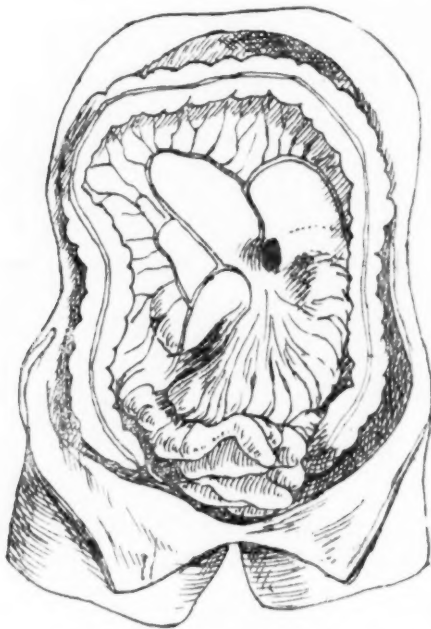
The duodenojejunal fossa.

Petersburger Medicinische Zeitung, 1802, Band ii), after the emptying of the sac of a left duodenal hernia, lying behind and to the right of the mouth of the sac. Brösike, of Berlin, gave this fossa the name "*Recessus duodenojejunalis posterior*," because "in the normal position of the gut the fossa lies immediately behind the flexure." Mr. Moynihan considers it more correct to say that the fossa lies immediately behind the upper portion of the ascending limb of the duodenum. The fossa is bounded in front by the duodenum, and behind by the parietal peritoneum covering the lumbar vertebræ. To the right is a fold of peri-

toneum containing the muscle of Treitz. To the left lies a fold running between the parietal peritoneum and the left side of the ascending duodenum. One point of great importance with regard to this fossa is that its highest degree of completeness is only found in association with the paraduodenal fossa. The cases of Gruber and Landzert (Fig. 2) are therefore the more readily understood.

4. *The Duodenojejunal Fossa* (Fig. 3). On dragging the transverse colon upward and the jejunum downward to the right,

FIG. 4.

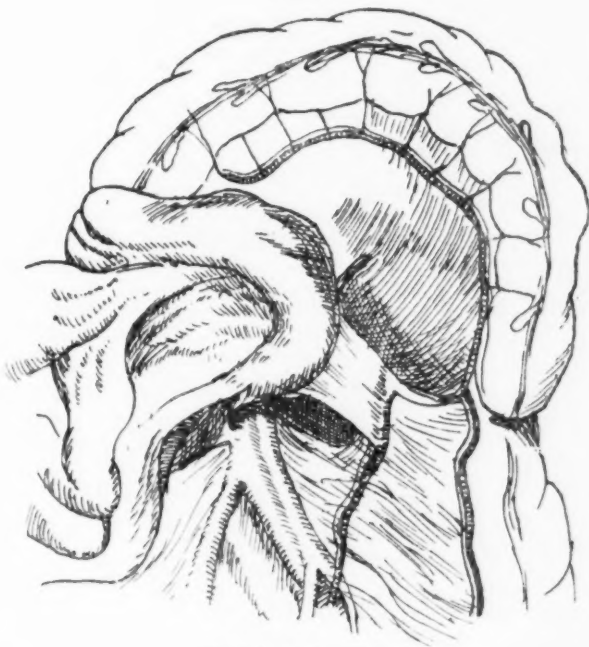


Recessus intermesocolicus transversus, intermesocolic fossa, or fossa of Brosike.

there can be seen at the root of the transverse mesocolon a fossa which results from the plunging as it were of the duodenojejunal flexure into the root of the transverse mesocolon. It is found in about 15 to 20 per cent. of the bodies examined. Laterally, it is bounded by two folds; in reality, the continuations backward of

the two leaves of the mesentery, which, skirting the duodenojejunal flexure, unite above it in a semilunar fold, whose edge looks downward and to the right. The fossa is bounded above by the pancreas, to the right by the aorta, to the left by the kidney. In the floor lies the left renal vein. The inferior mesenteric vein running upward and to the right forms a concavity, which corre-

FIG. 5.



The infraduodenal fossa.

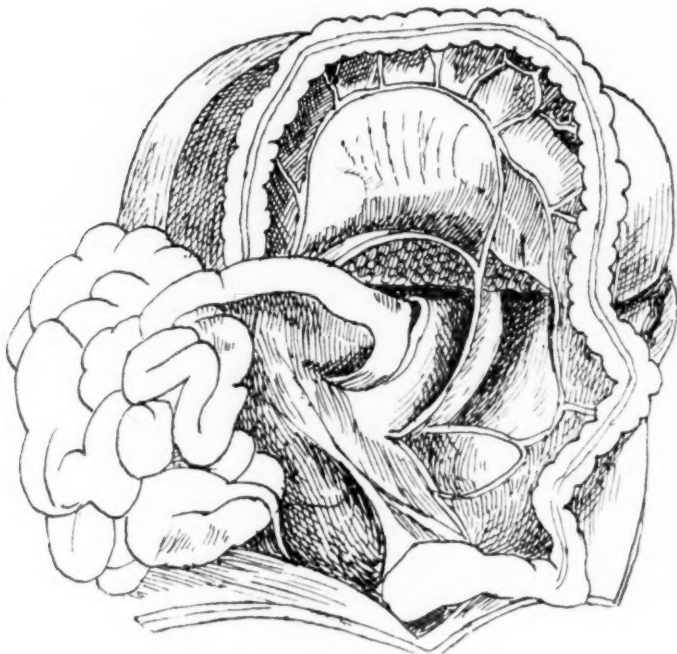
sponds fairly accurately to the upper limit of the fossa. Where this fossa is found, there never yet has been seen any other form of duodenal fossa.

5. *The Intermesocolic Fossa of Brösike* (Fig. 4). This fossa is rare. Mr. Moynihan has only seen it once. Brösike, who first described it, has met with it six times. It runs in the root of the transverse mesocolon. The upper wall is formed by the transverse mesocolon and pancreas, the lower by the duodenojejunal

flexure, the anterior wall by a fold of peritoneum uniting the under surface of the transverse mesocolon with the flexure. The middle colic artery lies near the opening to the right.

6. *The Infraduodenal Fossa* (Fig. 5). The orifice of this fossa looks downward, its apex reaches the duodenojejunal angle,

FIG. 6.



The paraduodenal fossa.

the muscle of Treitz, and the pancreas. It is bounded in front by the back of the transverse and ascending portions of the duodenum; behind by the aorta, which projects into the cavity of the fossa, and, laterally, by two serous folds—duodenoparietal—which pass between the duodenum and posterior parietal peritoneum on each side of the aorta.

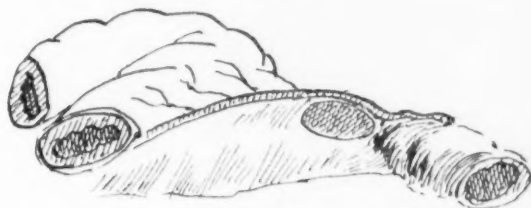
7. *The Paraduodenal Fossa*, Fossa of Landzert (Figs. 2 and 6). This fossa exists not seldom in conjunction with others. In

its typical form the fossa may be thus described. It is caused by the raising up of a fold, the plica venosa, by the inferior mesenteric vein. The fossa is situated to the left, and some distance from the ascending limb of the duodenum. Behind, the sac is bounded by the parietal peritoneum covering the psoas, the renal vessels, the ureter, and a portion of the left kidney. The orifice of the sac is wide and looks to the right.

This fossa is of much practical importance, as it forms, according to Mr. Moynihan, the sac of a left duodenal hernia. Of these, as we shall see, the above authority has collected no less than fifty-seven examples.

8 and 9. *The Mesentericoparietal and Parajejunal Fossæ* (Figs. 7 and 8). Mr. Moynihan takes these together, as, in his

FIG. 7.



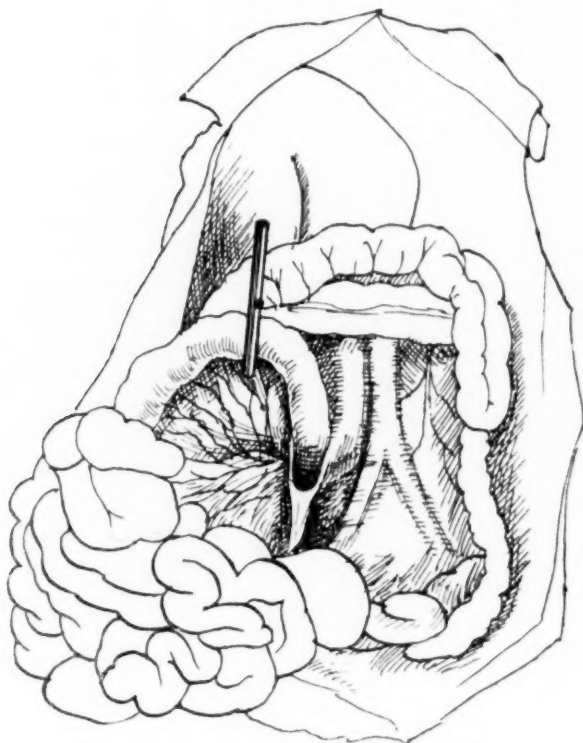
The fossa of Waldeyer, lying behind the superior mesenteric artery and below the duodenum.
The mesentericoparietal fossa.

opinion, they are practically the same fossæ under different conditions. The superior mesenteric artery arching downward with a slightly concave curve to the right raises a fold of peritoneum, and in the concavity of this arched fold a fossa may exist. Its most usual position is in the first part of the mesojejunum, immediately behind the superior mesenteric artery, and immediately below the duodenum. The orifice looks to the left, the fundus to the right and downward; in front it is bounded by the superior mesenteric artery, and behind by the lumbar vertebræ.

The chief interest of this fossa lies in the fact that both Waldeyer, who was one of the first to describe it, and Mr. Moynihan

consider it possible that, from its relation to the mesentery, it may explain some of those cases of hernia into or through rents in the

FIG. 8.



Fossa parajejunalis of Brösike, showing jejunal adhesion.

mesentery, one such case of "mesenteric hernia" having been described by Sir A. Cooper as long ago as 1807.

DUODENAL HERNIA.

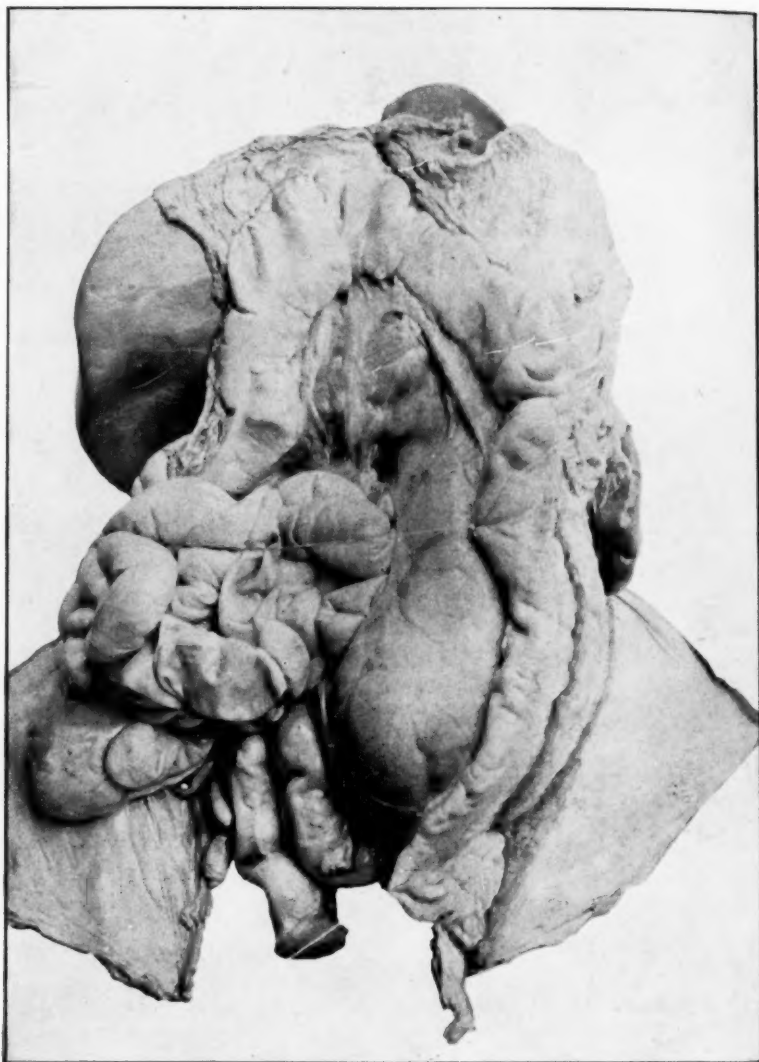
This is of two kinds. In the first, and commonest, the hernial sac increases to the left of the middle line, in the second to the right. In both cases there may be an upward and downward increase, but the essential difference between the two forms lies in the varying direction of their lateral deviation. The term at pres-

PLATE I.



Left duodenal hernia. (Specimen 1279, St. Thomas's Hospital Museum.) A specimen showing a hernia of the jejunum into the fossa paraduodenalis. The colon has been raised to expose the small intestine, which has been filled with plaster of Paris. The mouth of the sac is about six inches in diameter, and lies immediately below the termination of the duodenum, the intestine within it comprising the highest coils of the jejunum. The contents were readily removable from the sac after death; the hernia was found accidentally in a child. Of this preparation, Mr. Moynihan says, "This is the most beautiful specimen of a left duodenal hernia in the early stage which I have met with. In the margin of the orifice the inferior mesenteric vein is distinctly seen."

PLATE II.



Left duodenal hernia. (Dr. Griffith's case.) From a female child, aged thirteen months. Death from catarrhal pneumonia, following measles.

On opening the abdomen, it was found that the greater part of the ascending colon was covered behind by peritoneum, so as to lie between the two layers of the mesentery. To the left of the abdominal cavity a sac containing bowel was seen. This sac was about four and one-half inches long, and three and one-half inches in the transverse diameter, and extended from the middle line, where the entrance was placed, to the outer side of the descending colon. A short descending mesocolon was present. In the vertical direction the sac reached from the pancreas to a little below the brim of the pelvis. The sac contained rather more than half the intestine. On removing the bowel from the sac, three small descending intussusceptions were seen. The orifice of the sac, which looked directly to the right, admitted four fingers. The edge was very sharp, and contained the inferior mesenteric vein and the ascending branch of the left colic artery. The duodenojejunal flexure lies in the sac at the upper and inner extremity. The inferior duodenal fold is present, though small, and not as acutely defined as it generally is in children. No symptoms were present during life.

PLATE III.



Left diaphragmatic hernia, showing sac as it appeared on opening abdomen. (Case of Dr. L. Mitchell, of Chicago.) The patient, a woman aged thirty years, had been shot. At the autopsy, instead of coming upon the omentum or intestine, a white glistening sac like a mesenteric cyst or ovarian tumor was found. This was surrounded by the colon. The omentum was rolled up between the sac and the transverse colon. At the lowest aspect of the sac on the right was an elliptical opening, from which the lower part of the ileum escaped to join the caecum. The rest of the small intestine was contained within the sac. The inferior mesenteric vein bordered the orifice of the sac, being about the size of a goose-quill. The colica sinistra artery ran at some little distance from the free border. Only a part of the coils of intestine could be pulled out, the rest being strongly adherent to the sac.

PLATE IV.



Left duodenal hernia, showing sac and contents lifted up, with stake passed under ileum as it left sac. (Case of Dr. L. Mitchell, of Chicago.) The patient, a woman aged thirty years, had been shot. At the autopsy, instead of coming upon the omentum or intestine, a white glistening sac like a mesenteric cyst or ovarian tumor was found. This was surrounded by the colon. The omentum was rolled up between the sac and the transverse colon. At the lowest aspect of the sac on the right was an elliptical opening, from which the lower part of the ileum escaped to join the caecum. The rest of the small intestine was contained within the sac. The inferior mesenteric vein bordered the orifice of the sac, being about the size of a goose-quill. The colica sinistra artery ran at some little distance from the free border. Only a part of the coils of intestine could be pulled out, the rest being strongly adherent to the sac.

ent in most common use is "duodenojejunal hernia," which has nothing whatever to recommend it; for it is intended to convey the idea of the origin of the hernia in the inferior duodenal fossa, a state of things which never occurs; and into the fossa which Jonnesco and Mr. Moynihan have termed "duodenojejunal," there is only one case on record, and that a doubtful one. For every reason, then, the author claims that the terms "right duodenal hernia" and "left duodenal hernia" are abundantly justified.

LEFT DUODENAL HERNIA. (PLATES I, II, III, IV, and FIG. 9.)

Point of Origin.—With his usual minuteness of detail, Mr. Moynihan rejects all the fossa save one, and that is the paraduodenal fossa, or fossa of Landzert (Figs. 2 and 6). With regard to the inferior duodenal fossa, or fossa of Treitz, it was long supposed—and still the belief is universal—that all forms of duodenal herniæ originate in this fossa. Treitz himself taught this, and later authors have implicitly accepted his view. Mr. Moynihan differs on this ground. The typical inferior duodenal fossa, as he has shown, is non-vascular; the orifice of a duodenal hernial sac is always vascular. In the neck of such a sac can always be seen the inferior mesenteric vein (Plate I). The left colic artery may be closely applied to it, or it may be some little distance away. The two are very distinctly shown in a preparation described by Dr. Pye-Smith, Specimen 1084, Guy's Hospital Museum. But of the position of the inferior mesenteric vein in all the specimens Mr. Moynihan has examined there is no doubt whatever; of all points, the vein is the one of chiefest importance. The fold containing the vein is the plica venosa, and the fossa bounded by such a fold is the paraduodenal fossa, or fossa of Landzert. It is this fossa then that, so far as our present knowledge goes, forms the sac of a left duodenal hernia. The formation of such a hernia in the superior duodenal or the duodenojejunal fossa is not denied; it is, however, exceedingly unlikely.

Conditions predisposing to the Hernia.—Treitz enumerated

the following three as essential for the formation of a duodenal hernia: (1) The existence of a fossa and its boundary-fold; (2) the presence of the inferior mesenteric vein in the fold; (3) sufficient mobility of the small intestine to admit of its introduction into the sac formed at the expense of the fossa.

Mr. Moynihan gives the following characteristics as invariably present in a left duodenal hernia: (1) The presence of the inferior mesenteric vein in the neck of the sac. The extent of the margin actually formed by the vein varies somewhat. In all, however, for a greater or less distance, generally greater rather than less, the vein is present and quite easily recognizable (Plate I); for a portion of the distance it is usually placed in close relationship with the left colic artery. (2) The hernia spreads either outward towards the descending mesocolon or upward into the transverse mesocolon, or both. (3) The hernial sac consists of a single layer of peritoneum. In its expansion away from the spine, the sac will rest behind on the various structures placed on the posterior abdominal wall. In front of it will be the posterior parietal peritoneum, more or less closely united to the sac-wall. The hernial contents have, therefore, two layers of peritoneum in front of them and one behind.

The Neck of the Sac.—As a general rule, the orifice of the sac is situated at the back of the hernia, close to the lumbar vertebræ. In the smaller herniæ it is situated to the right of the hernial mass, and looks slightly to the front. As the mass of bowel contained within the sac increases, the relative position of the orifice becomes altered, being situated to the right and increasingly posterior. In a large hernia it is necessary, in order to expose the neck of the sac, to drag it well over to the left side. The orifice is then seen close to the third lumbar vertebra. As the herniæ increase in bulk, the vertical diameter increases until eventually the sac may extend quite down to the region of the cæcum (Fig. 9). The orifice is bounded behind by the posterior parietal peritoneum. The upper, anterior, and lower boundaries of the opening are

formed by the plica vasculosa (*vide supra*). The left colic artery is generally closely applied to the inferior mesenteric vein throughout the whole of the anterior portion of the fold. At the mouth of the sac is always seen that part of the intestine which is leaving

FIG. 9.



Treitz's case of left duodenal hernia.

the sac to be continuous with the small intestine, if any, between the sac and the cæcum.

The Size of the Hernia.—This varies enormously,—in some cases no larger than a walnut, in others it practically fills the whole abdomen. Several of the smaller specimens have been observed in necropsies performed on children (Plate I). The majority of the cases recorded are those of herniæ where the whole or the

larger part of the small intestine lay in the sac, and the patients at or well beyond adult age.

Relations.—These when the hernia is small are as follows. It rests on the psoas, the inner portion of the kidney, and renal vessels; above, it may reach the pancreas. When the hernia is reaching larger dimensions, its position depends on the degree of development of the descending mesocolon. If this be little developed or absent, a hernia will push the colon at first outside. The hernia is situated in the middle of the abdominal cavity, and the colon surrounds the mass. If the mesocolon be more or less complete, this structure will be "used up" by the oncoming hernia, and its layers will be spread out on the anterior wall of the sac. The subsequent enlargement of the sac pushes the descending colon downward and to the right. The splenic flexure is then approximated to the cæcum. Under all circumstances the relative positions of the cæcum and ascending colon remain unchanged.

The gradual increase of the hernia will be affected (1) by the degree of laxity of the retroperitoneal tissue; (2) by the extensibility of the peritoneum.

Frequency of the Hernia.—Mr. Moynihan has been able to collect records of no fewer than fifty-eight, perhaps fifty-nine, cases of left duodenal hernia.

RIGHT DUODENAL HERNIA. (PLATE V and FIGS. 10, 11, 12, 13.)

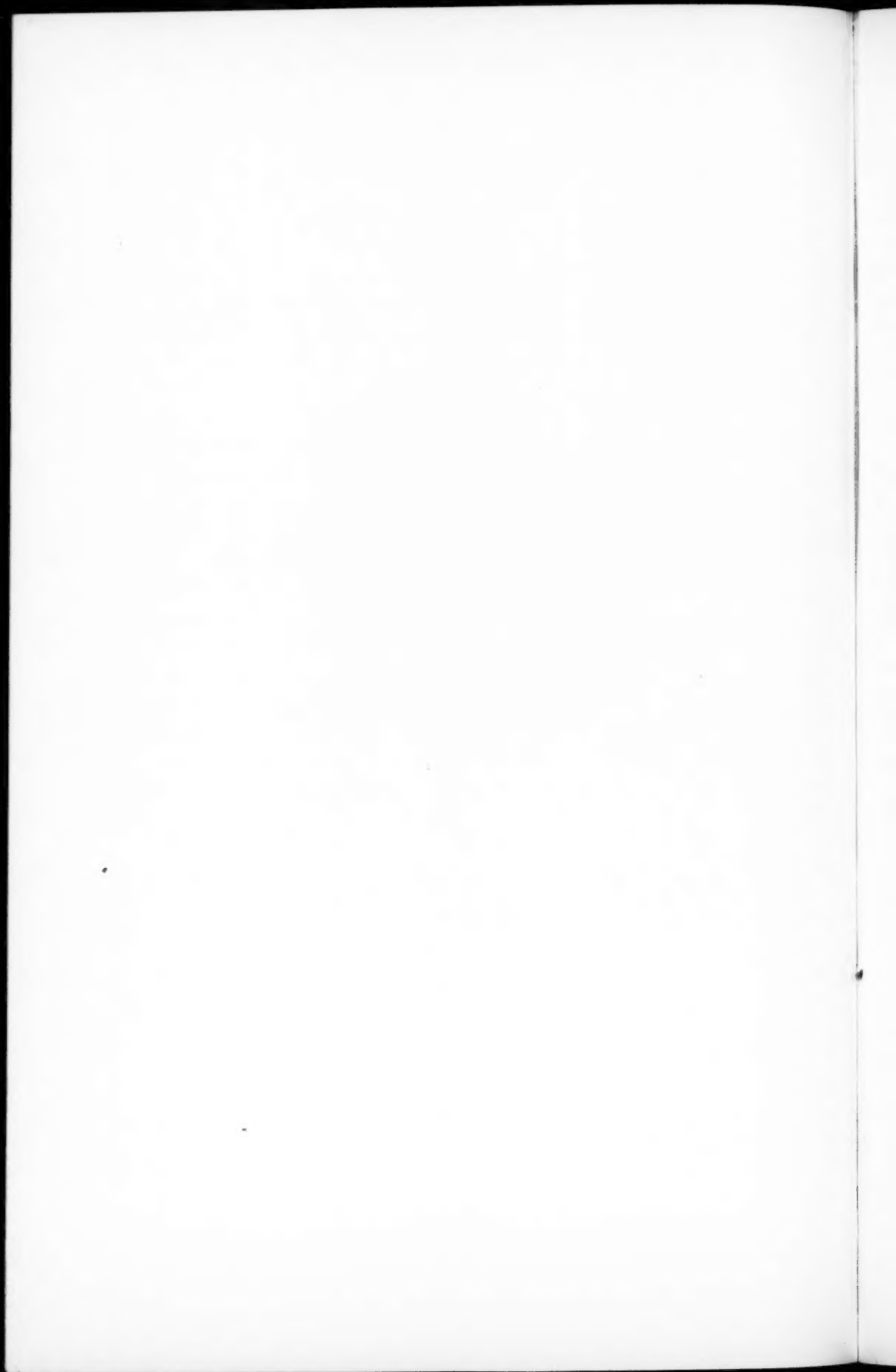
Point of Origin.—A right duodenal hernia, in its earlier stages, occupies the right half of the abdominal cavity; as it becomes larger, it pushes its way over to the left side, and finally occupies equally the two halves of the body. Mr. Moynihan is not as decided as to the fossa in which this variety originates as he was in the case of the left duodenal hernia. Having had the opportunity of examining closely two cases of right duodenal hernia, Mr. Moynihan is of opinion that the exact situation of the commencing sac in these herniæ corresponds to the fossa of Waldeyer (*vide supra*, Fig. 7, p. 129). This fossa lies within the con-

PLATE V.



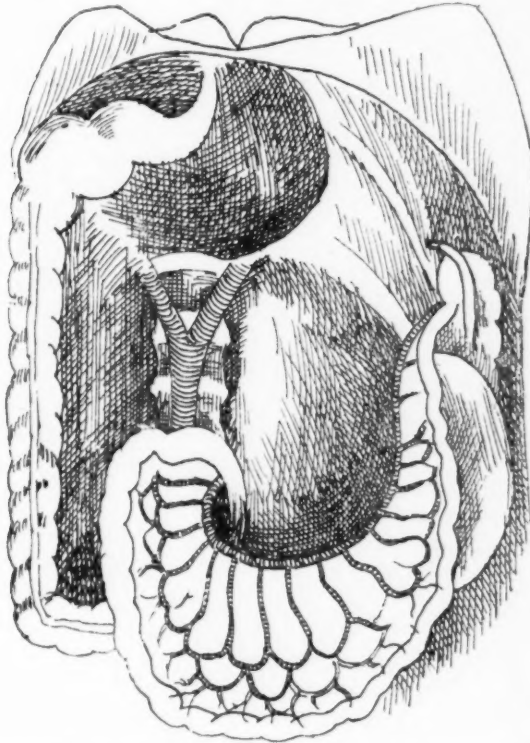
Right duodenal hernia. (St. Mary's Hospital Museum.) Mr. Jackson Clark gives the following description: "A man of middle age was admitted with symptoms of acute intestinal obstruction. He said he had been seized with sudden pain, which caused him to fall down in the street. Mr. Page performed abdominal section. This revealed a large, smooth, rounded swelling like an ovarian cyst, but giving a tympanic note. After passing a hand into the abdominal cavity, Mr. Page was able to withdraw the whole of the small intestine from an aperture at the lower part of the hernia. The patient gradually sank after the operation.

The necropsy revealed a large, flaccid cyst consisting of a double layer of peritoneum. Into this the whole of the small intestine could easily be replaced. About a foot of the upper ileum was deeply congested, the rest of the small intestine had a normal appearance. By raising the lower portion of the hernia to the right, the neck of the sac could easily be seen. It readily admitted the closed hand. In front it was bounded by the superior mesenteric artery, covered by peritoneum; behind, by the peritoneum covering the abdominal wall.



cavity of the arch formed by the superior mesenteric artery, its orifice looking to the left, its fundus to the right and downward. Behind it are the lumbar vertebræ covered by peritoneum. Any intestine entering this pouch would develop a hernia fulfilling all the requirements of a right duodenal hernia. As it enlarges

FIG. 10.

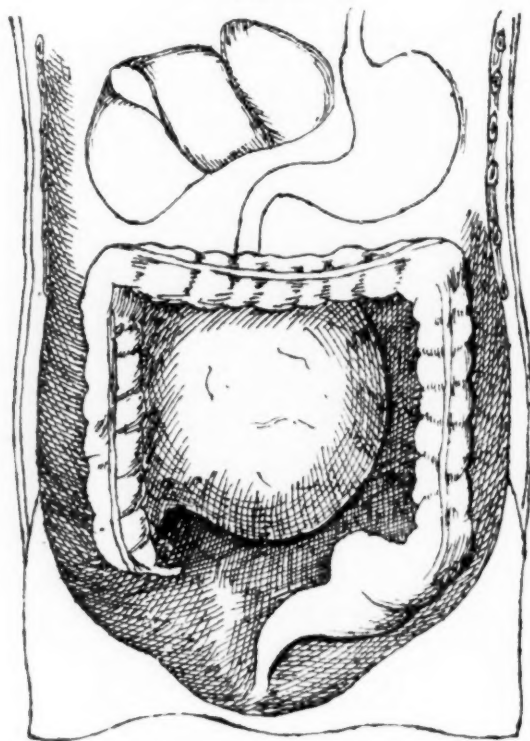


Right duodenal hernia, showing the orifice of the sac bounded by the superior mesenteric and ileocolic arteries. (Gerard-Marchant.)

towards the right, and up or down, this form of hernia would behave in a manner precisely identical with the left. The posterior parietal peritoneum would be stripped up until the colon was reached. Then either the colon would be pushed away from the tumor until the latter lay surrounded by the arch of the colon, as

in Gerard-Marchant's case (Figs. 10, 11); or if an ascending mesocolon were found, this would be spread over the anterior surface of the sac, and the hernia passing behind the colon would appear on its outer side, as occurred in a case of Brösike.

FIG. 11.

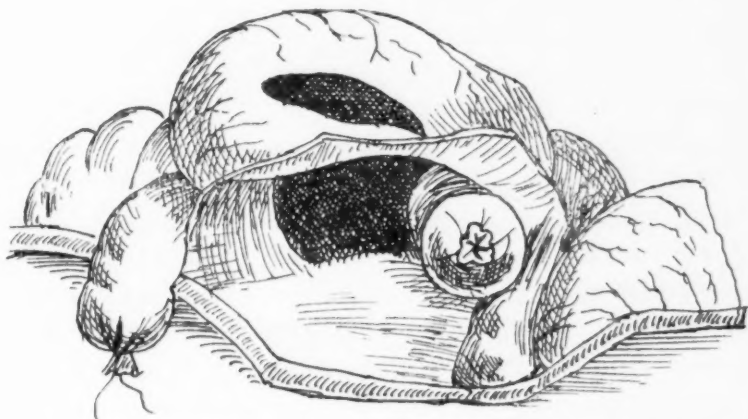


Right duodenal hernia. The sac is surrounded by the colon.

Fig. 12 was taken from one of the two cases of right duodenal hernia which Mr. Moynihan has had the opportunity of closely examining. It was taken from a case under the care of the late Dr. M. McGill. Dr. Barrs performed the necropsy and reported the case (*Lancet*, 1891). The whole of the small intestine was contained in the sac. In the anterior margin of the sac ran the superior mesenteric artery. In Fig. 12 the transverse

portion of the duodenum is shown tied and cut across. This part of the intestine then was fixed in the posterior and upper part of the sac. The fossa of Waldeyer lies nominally below the duodenum, but evidently here the fossa had been enlarged by the rolling away of the peritoneum up to the superior mesenteric artery. This vessel, emerging from beneath the pancreas, crosses the duodenum, and, in the increase of the fossa in this direction, the duodenum becomes more and more uncovered, until the whole

FIG. 12.



Right duodenal hernia (Barrs). Orifice of the sac formed by the fossa of Waldeyer.

of the anterior wall of the orifice of the sac is bounded immediately by the artery quite up to the point of its emergence.

Frequency of the Hernia.—Mr. Moynihan has collected fourteen authentic cases of right duodenal hernia. These fourteen added to the fifty-eight of left duodenal hernia make seventy-two cases of duodenal hernia altogether; a fact which emphasizes the importance of this hitherto neglected subject and the value of Mr. Moynihan's labors by which so much light has been thrown upon it.

Diagnosis of Duodenal Hernia.—It is found at all periods of life. The youngest case is one of Brösike's, the child being fourteen days old. Treitz records one in a girl aged two months. The

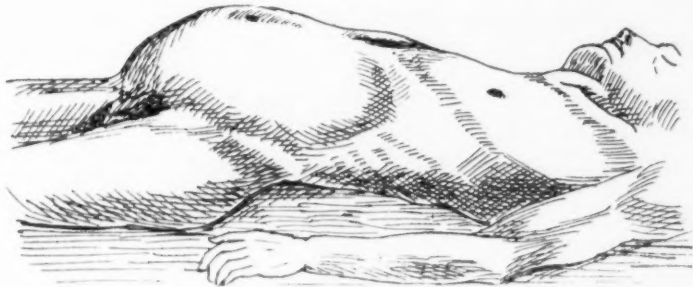
majority of cases recorded have occurred in patients who have died of internal strangulation. From an examination of the bodies in these cases, such a profound deviation from the normal as exists must have been the work of years. The hernia is chronic; the strangulation alone is acute. In some of the smaller cases—found in children—the hernia has been discovered by accident. Mr. Shattock's very beautiful specimen (Plate I) is an example of this kind. Had the child lived, this hernia would probably have gone on increasing until a sac filling the abdomen had been formed; then fatal strangulation might have supervened. It is an important question to consider whether there are any physical signs by which we are able to predict, with a fair degree of accuracy, the evidence, during life, of these forms of herniæ. Mr. Moynihan tells us that the possibility of such a successful diagnosis was first suggested by Leichtenstern in his admirable article in "Ziemssen's Encyclopædia," in the following words: "Under favorable circumstances, if the hernia is of notable size, I consider it possible to make a probable diagnosis, not a positive one, but, still, one that is based upon reasons. The circumscribed globular distention of the mesogastrium, with retraction of the region corresponding to the colon; the firm, elastic spherical lump which can be distinctly felt when the abdominal wall is thin, giving the impression of a large, somewhat movable cyst, and extending from the mesogastrium to the left; the peculiarity that this well-defined tumor always yields a sonorous note on percussion, and clear intestinal sounds on auscultation; also the loss of blood from the rectum and the presence of hæmorrhoids in consequence of the pressure on the inferior mesenteric vein—permit, when taken in connection with the subjective troubles indicating chronic disease of the abdominal organs, a probable diagnosis to be made."

In Dr. Barrs' case (*loc supra cit.*, Fig. 13) the swelling chiefly or entirely involved the lower two-thirds of the abdomen, so leaving the epigastric region depressed and empty.

Mr. Moynihan considers that the tumor, which exists in cases of duodenal hernia, will have the following attributes:

(1) It is limited to a definite region of the abdomen. In left duodenal hernia it lies, at first, to the left and upper, in right duodenal to the right and lower, part of the abdomen, but in each

FIG. 13.



Appearance of the abdomen in Dr. Barrs' case, showing median distention, and flatness in the epigastric and colic regions.

case spreads finally over almost the whole abdominal cavity. Around the swelling is an area of depression corresponding to the colon. In size the tumor may vary. It has been described as equal to the "size of a child's head." In Barrs' case it was as large as "a nine-months' pregnancy." It is slightly movable, but fixed during respiration.

(2) The tumor is marked out distinctly by palpation; on percussion it is always resonant. The striking feature is that the tumor is a palpable, definite, resonant mass. In the centre of the tumor, or all over its surface, may be noticed coils of intestine. The tumor may bear a very obvious relation to the clinical condition of the patient, becoming more tense and prominent, and very much more tender when the symptoms undergo exacerbation. As the symptoms decline in severity, the tumor becomes less aggressive.

(3) On auscultation, distinct gurgling sounds may be heard anywhere in the tumor.

(4) It is an important aid to diagnosis to remember that, owing to the position of the inferior mesenteric vein in the margin

of the orifice of a left duodenal hernia, the radicles of this vein may become enlarged, as in the case of the hæmorrhoidal veins, or venous trunks in the anterior abdominal walls may be so increased in size as to form striking features of the case.

The symptoms may have been so slight that little or no attention was paid to them, or they may have been so sudden as to swiftly strike the patient down when apparently in good health. It is not without some importance to note that in the most carefully recorded cases a history of chronic slight digestive or intestinal troubles could be obtained. In the recording of future cases, this thorough investigation of the earliest history should be especially attended to.

Treatment.—If acute obstruction exists, whatever the diagnosis may be supposed to be, the abdomen will be promptly opened. If a duodenal hernia were found, it would be reduced. The orifice of the sac should be dilated, not incised, if it can be possibly avoided. If division be needful, the probable proximity of a large vessel, *e.g.*, the inferior mesenteric vein or the left colic artery, must be remembered. If one of these has to be divided, two ligatures must be first applied; but the effect of ligature and division of the above vessels on the intestine which they supply must always be a very grave matter.

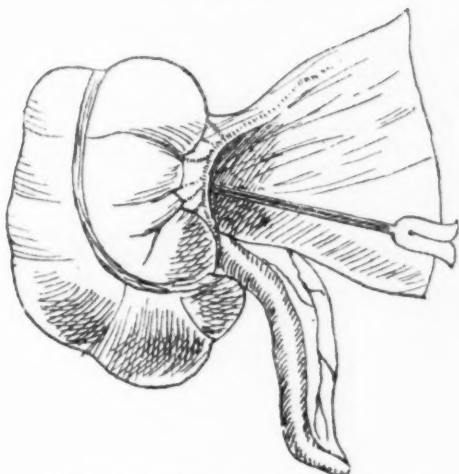
Two cases only have proved successful after operation, that of Neumann's, one of right duodenal hernia (*Deutsche Zeitschrift für Chirurgie*, 1898, Band xlvii, p. 476), and Mr. Tubby's, a case of presumably left duodenal hernia (*British Medical Journal*, Vol. ii, 1898).

THE PERITONEAL FOLDS AND FOSSÆ IN THE NEIGHBORHOOD OF THE CÆCUM AND VERMIFORM APPENDIX.

While Mr. Moynihan deals with these subjects in his usual complete and detailed method, there is not the same need to pay the same attention to this subject as in that of duodenal herniæ.

Pericæcal herniæ are extremely rare. Mr. Moynihan has only collected sixteen cases; of these he rejects nine; of the remaining seven several are very incompletely reported. Again, while Mr. Moynihan is the first to give us an authoritative account of the duodenal fossæ and herniæ in our own tongue, English-speaking surgeons have been rendered familiar with the fossæ about the cæcum and appendix by many writers, American as well as English. For these reasons, the very rare herniæ which are met with in this region and the fossæ in which they occur may be considered together very briefly.

FIG. 14.



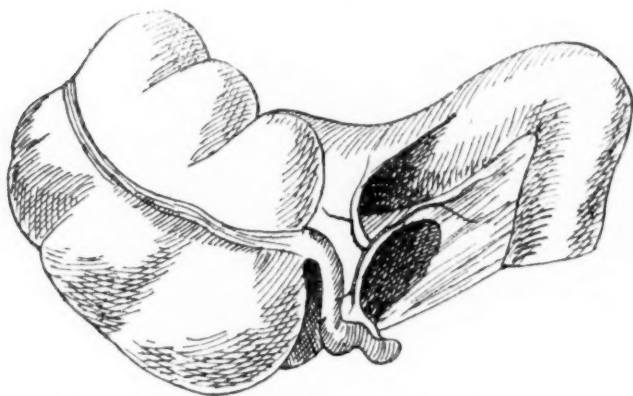
The anterior vascular (ileocolic) fold and fossa.

Mr. Moynihan, in his careful and elaborate study, shows that six fossæ may be met with in this region; of these fossæ only three have been found to contain herniæ, and these extremely rarely.

1. *Anterior Vascular Fossa* (Fig. 14).—(Ileocolic Fossæ of Lockwood and Rolleston. Superior Ileocæcal Fossa of Treves.) Mr. Moynihan prefers the first to the better known names, as this fossa has for its anterior boundary the anterior vascular or ileocolic fold (Fig. 14), a fold which passes from the front of the

mesentery over the anterior aspect of the colon and then on to the front of the cæcum to an extent which varies with age, being more extensive in earlier life. Because this fold is very constant, and because it is raised up by that one of the two anterior branches of the ileocolic artery which, continuing the line of the main trunk, runs over the front of the ileocolic junction, Mr. Moynihan prefers the name "anterior vascular" to "ileocolic" for this fold. The fossa of the same name lies behind this fold in front, and the mesentery, ileum, and a small portion of the cæcum behind. It is a narrow fossa, which is stated by Mr. Moynihan to diminish

FIG. 15.



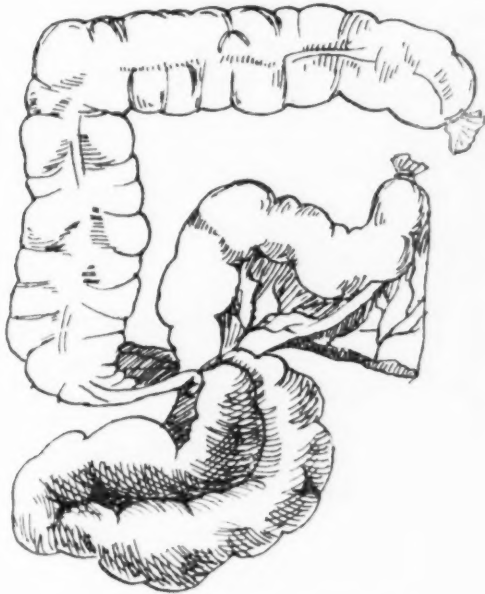
The meso-appendix and the ileo-appendicular fold, and fossa.

in size as life advances. He has found no case of hernia into it recorded.

2. *Ileo-Appendicular Fossa* (Ileocæcal Fossa of Lockwood; Inferior Ileocæcal Fossa of Treves, Fig. 15). This fossa lies behind the ileo-appendicular fold and the meso-appendix. The ileo-appendicular or ileocæcal fold extends from the lower border of the ileum—that directly opposite the line of the mesenteric attachment—to the anterior surface of the meso-appendix. The size of this fossa differs very largely, being dependent chiefly on the size of the ileo-appendicular fold.

Hernia.—Mr. Moynihan has collected four cases of hernia into the ileo-appendicular fossa, one only of which is well authenticated. It is recorded by Dr. T. E. Little (*Dublin Journal of Medical Science*, Vol. iii, 1871, p. 237, Fig. 16). The patient, aged sixty, had enjoyed excellent health up to the attack, nine days after the first evidence of which he died, from symptoms which may, in brief, be described as those of unrelieved strangulated

FIG. 16.



Ileo-appendicular hernia. (Little's case.)

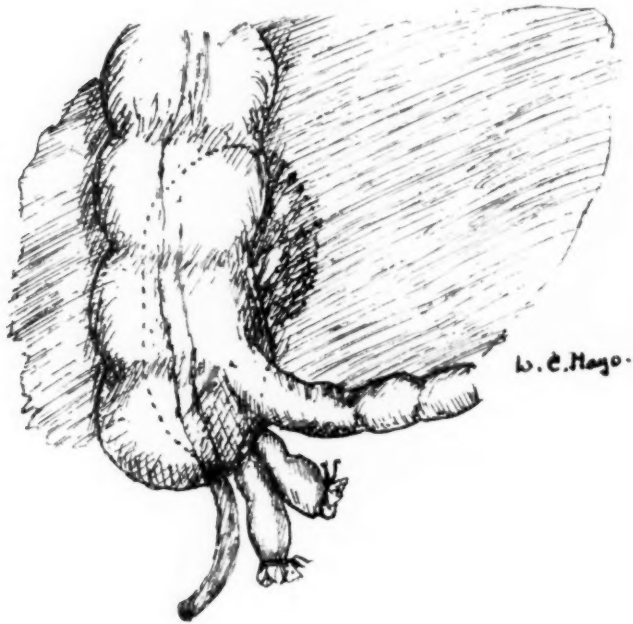
hernia. A large loop of the ileum, sixteen or eighteen inches long, was strangulated and gangrenous.

Fossa Ileocacalis Intima (Fossa of Hartmann). In some cases the lower attachment of the mesentery to the iliac fossa is prolonged into a sharp fold springing from the ileocolic angle, and back and inner part of the cæcum, and running backward to the iliac fossa. Between it and the meso-appendix the fossa of

Hartmann may exist. Mr. Moynihan strongly doubts its frequency. He follows Leichtenstein in considering that one case of hernia has occurred here. It is recorded by Dr. Snow (*London Medical Gazette*, 1846). The patient, aged twenty-four, died, with the symptoms of intestinal strangulation, on the fourth day of the attack. A knuckle of the ileum was found strangulated.

The Retrocolic or Retrocaecal Fossa (Subcaecal Fossa of Lockwood, Fig. 17). In order to see this, it is needful to turn the

FIG. 17.



Hernia into the retrocolic fossa. (Aschoff.)

cæcum upward. There will then be exposed a fossa of varying size behind the cæcum and ascending colon, between the layers of the ascending colon.

Mr. Moynihan has collected eleven cases which have been recorded as instances of retrocolic hernia. Of these, he states that only two can be accepted with any show of probability, and, as

a result, concludes that this form of hernia is very rare—rarer, in fact, than ileo-appendicular hernia.

In the short time that has elapsed since, another case has been recorded. It is by Aschoff (*Berliner Klinik*, October 1896), and it was illustrated in Fig. 17. The patient was a female aged forty-eight. She was suddenly seized with an acute attack of abdominal pain in the right lower abdomen. Constipation followed, but enemata on two occasions brought away a little fæcal matter. On the twenty-first day an operation was performed by Körte. The small intestine was found immensely distended; the ascending colon, cæcum, and the termination of the ileum were collapsed. A coil of intestine was found in a pouch behind the cæcum and ascending colon. The ascending colon had an unusually long mesentery. The strangled gut was withdrawn, and the patient made a good recovery.

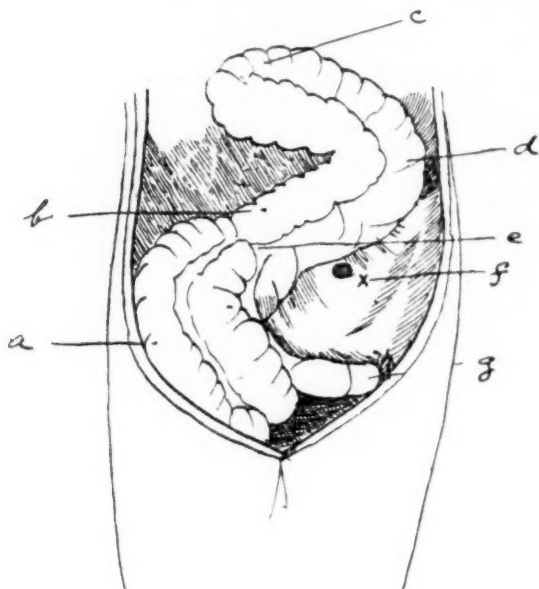
THE INTERSIGMOID FOSSA AND HERNIA. (FIG. 18.)

Owing to the great rarity of hernia here,—Mr. Moynihan considers only two cases to be authentic,—the anatomy of the fossa and the hernia may be considered together and briefly.

The Intersigmoid Fossa (Fig. 18). Mr. Moynihan estimates the frequency of this fossa at a little over 70 per cent. Its frequency becomes less with increasing years, owing, as Treitz pointed out, to the processes of thickening and adhesion which are often present in the mesosigmoid of the aged and which tend to obliterate the fossa. Its orifice is found by drawing the sigmoid loop upward and to the left, and thus exposing the under surface of the mesosigmoid. On this surface can be seen the entrance to the fossa situated in the line of attachment of the mesosigmoid at a point near the inner border of the psoas magnus. It lies over the common iliac artery in front of its bifurcation. The fossa lies between the mesosigmoid and the posterior parietal peritoneum. The sigmoid artery lies above it and to the right (Treves). The only two cases considered by Mr. Moynihan as being authentic are those published by Mr. Eve (*British Medical Journal*, June

13, 1885) and Mr. W. W. Adam Eccles (St. Bartholomew's Hospital Reports, Vol. xxxi, p. 177). In each case a loop of small intestine was the part strangled.

FIG. 18.



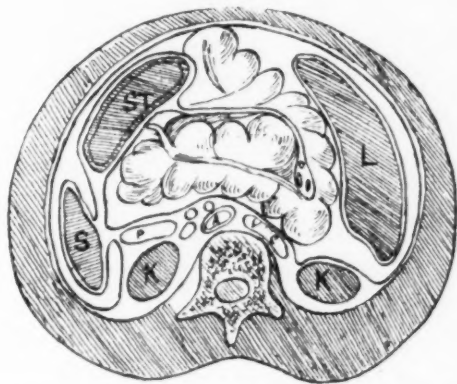
Mr. Eve's case of intersigmoid hernia.—*a*, Caecum; *b*, *c*, ascending colon; *d*, transverse colon; *e*, band of fibrous tissue; *f*, intersigmoid fossa; *g*, end of sigmoid flexure.

HERNIA INTO THE FORAMEN OF WINSLOW. (FIG. 19.)

This hernia is extremely rare. This is explained by the fact, long ago pointed out by Engel, that the transverse colon forms an insuperable barrier to the passage of the small intestine towards the foramen. Mr. Moynihan adds that the foramen is very probably potential rather than actual; the anterior and posterior boundaries being usually in contact. Mr. Moynihan finds eight cases recorded. In six of these it was the small intestine, in two the large, which was involved. To account for this, Mr. Moynihan gives, as explaining conditions, (1) a common mesentery for the whole intestine; (2) abnormal length of the mesentery, and, consequently, undue mobility of the intestine; (3) abnormally

large size of the foramen. The best recorded cases are those by Dr. E. Square, of Plymouth (*British Medical Journal*, Vol. i, 1886, p. 1163), and Sir F. Treves (*Lancet*, October 13, 1888, Fig. 19). In the first case the patient died after an obstruction of between three and four days; the ileum was the part involved. It was thought that an early operation would have been successful. At the necropsy the bowel was withdrawn with some difficulty. In the case of Sir F. Treves, two or three feet of small intestine,

FIG. 19.



Section (diagrammatic) of the abdomen at the level of the foramen of Winslow, showing the hernia *in situ*. (Treves.)

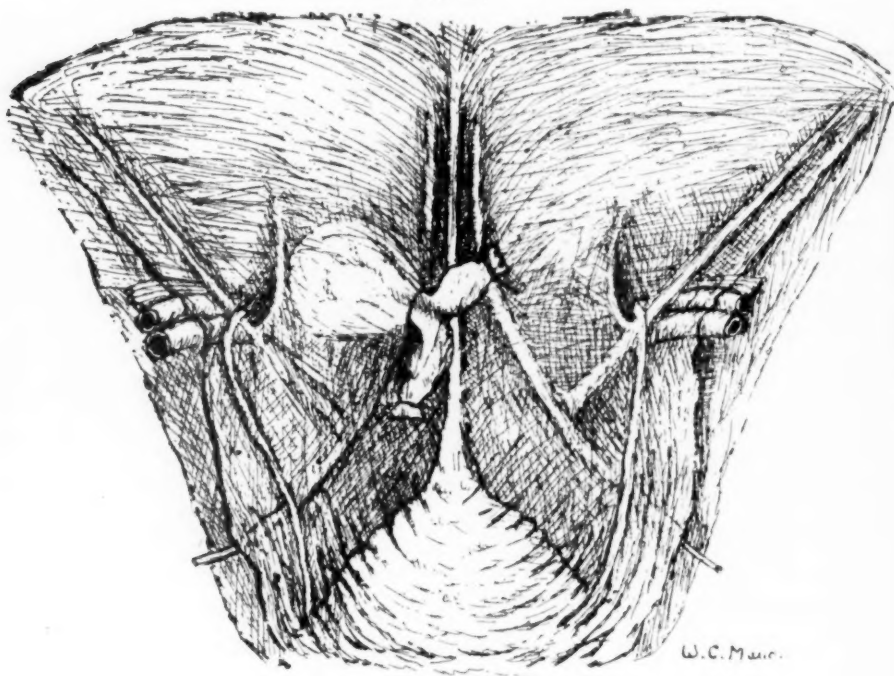
the cæcum ascending and great part of the transverse colon, were involved. The small intestine alone could be withdrawn. At the necropsy, reduction of the rest could not be accomplished until the hepatic artery, the portal vein, and the bile-duct had been divided.

Diagnosis.—Mr. Moynihan thinks that in a typical case we may expect to find acute intestinal obstruction, with intense, almost intolerable, epigastric pain, and epigastric prominence. He further states that it is interesting to note that there are no recorded symptoms of pressure in the hepatic artery, portal vein, or bile-duct.

Treatment.—Mr. Moynihan is of opinion that where, as is probable, reduction is found impracticable, the formation of an artificial anus is the only possible treatment.

Hernia along the Line of the Obliterated Hypogastric Artery.
—Aschoff (*Berliner Klinik*, October, 1896) records the case of a man, aged sixty-one, who for eleven years had noticed a left inguinal hernia which had been readily controlled by a truss. Suddenly, after the reduction of the hernia, an acute seizure of abdominal pain was experienced. Symptoms of intestinal obstruc-

FIG. 20.



Hernia along the line of the obliterated hypogastric artery. (Aschoff.)

tion were observed. The diagnosis rested between reduction in mass and internal strangulation near the internal abdominal ring. At the operation (Körte) a strangled loop of gut was found lying in a pouch to the outer side of the obliterated hypogastric artery. The internal abdominal ring and its surroundings were quite normal. The orifice of the pouch was closed by suture after the withdrawal of the gut. A good recovery followed.

INDEX TO SURGICAL PROGRESS.

GENERAL SURGERY.

I. Scopalamine, Morphine, Narcosis. By DR. E. BLOS (Carlsruhe). Scopalamine belongs in the atropine, tropene group, being isomeric with atropine, hyoscine, hyoscyamine, and atropine. The greatest drawback to its use is the inconstancy in the purity of the product, as it is apt to contain isomers.

Atropine, hyoscyamine, and scopalamine in small doses increase in direct proportion in their hypnotic properties. Oculists have found that whereas atropine instilled into the eye may cause symptoms of restlessness, scopalamine has a sedative effect. Kobert found that scopalamine applied to the cortex of the brain greatly diminished its electric irritability. The use of scopalamine in the human body bears this out, for in certain psychiatric clinics it has become indispensable, and it was here that Schneiderlin, the originator of this form of narcosis, first applied this drug as a narcotic in operations.

Outside of its effect on the cerebrum, it is in its accessory action that its great value rests, by permitting the conjoint administration of another sedative, morphine, which enhances its hypnotic properties, and at the same time permitting the administration of larger doses of scopalamine to the point of complete narcosis.

The peculiar combined administration of scopalamine and morphine consists in their cumulative hypnotic action on the cerebral centres, whereas on the cord and peripheral ganglia their action is antagonistic.

Action of scopalamine on the heart is harmless, the pulse-rate is increased, and the pressure of the blood is raised.

Oculists have testified that whereas scopalamine has replaced

atropine, the unpleasant symptoms of the latter have no longer to be fought with morphine. Scopalamine is a vasodilator. Respiration is accelerated and deepened. It is thus apparent that morphine produces diametrically the opposite effect.

Cyanosis, if it occurs, points to the preponderance of the morphine. Scopalamine tends more to paralyze the motor nerves, morphine to those of sensation. Bearing on the very important feature of muscle relaxation, paralysis is hardly the proper term, since some muscle tonus persist, and this deficiency limits the adoption of scopalamine and morphine.

The antagonism of scopalamine and morphine in combination is complete, whereas the hypnotic action becomes cumulative. The narcosis attainable obviates tissue changes incident to the use of chloroform and ether. (Nephritis, ether pneumonia, chloroform jaundice.) Shock is prevented, for, since scopalamine is far more rapidly eliminated, morphine outlasts it, and the beneficent action of morphine comes into play to avert shock. The blood-pressure being raised, hæmostasis must be more exacting. Recovery from the anæsthetic being far more rapid than after inhalation narcotics, the ingestion of food can soon begin without the likelihood of nausea and vomiting.

This method of narcosis was applied in 105 instances, 57 females, 48 males, between the ages of fifteen and seventy-three, to operations of all possible magnitude. The combination which proved most effective was five decimilligrammes scopalamine ($\frac{1}{120}$ grain) and three milligrammes morphine (one-half grain). Under these circumstances the pulse was accelerated and respiration diminished, wherefore a diminution of morphine was found necessary to two milligrammes (one-third grain).

The criterion of a good narcosis is dependent on the dilated pupil due to a predominating effect of scopalamine, and where this was absent, narcosis was more or less imperfect. The pupillary (mydriasis) reaction is therefore the index for a successive injection of scopalamine. With dilatation of the pupils, corneal

reflex becomes diminished and somnolence sets in; narcosis is profound within three-fourths to one and one-half hours, and lasts about one and one-half hours, about which time more scopalamine and morphine may have to be injected.

To ascertain the tolerance of scopalamine and morphine, on the evening before the operation, one-half the maximum dose is given, and out of 105 administrations, six times this was ill borne, and scopalamine and morphine were therefore not injected.

The worst to be said of scopalamine is its inconstancy, yet toxic lethal symptoms are unheard of. One death is reported after operation for resection of the os pubis, tuber ischii, and sacrum for tuberculosis in a tuberculous patient. Small dose was well borne (five scopalamine and three morphine). Dose for narcosis, ten decigrammes scopalamine and five milligrammes morphine, this repeated in three-fourths of an hour to one-half, later narcosis set in. Six hours after operation respiratory paralysis caused death.

Post-mortem. Amyloid viscera, bilateral pulmonary tuberculosis. Author attributes improperly acting kidneys as responsible for the slow elimination of scopalamine. Where narcosis is slow to appear or uncertain, it may be ushered in more speedily by a few inhalations of ether. In the presence of myocarditis, the dose should not exceed ten decigrammes scopalamine and six milligrammes morphine. The scopalamine to be kept dry and freshly prepared.—*Beiträge zur klinischen Chirurgie*, Band xxxv, Heft 3.

ABDOMEN.

I. A New Operation for Congenital Hernia of Infants. By DR. WILLY ANSHUTZ (Breslau). The treatment of the sac in congenital hernia is always a matter of great concern, since the laceration of the cellular tissues in isolating the cord structures offsets the conditions favoring perfect healing of the wound, renders the cord liable to injury, and finally requires a separate drainage of the serous investment of the testicle. To obviate all of

these disadvantages, the author has of late applied the principle of the Jaboulay Winkelman method employed for operation of hydrocele, consisting in an eversion of the sac.

The neck of the hernial sac is isolated. An incision of the smallest possible size is made into the sac that will permit of the reduction of its contents. The neck of the sac is closed by a purse-string suture passing through the peritoneal layer only. The central part of the hernial sac is thus disposed of. Through the slit in the sac the testicle is dragged out, thus everting its investments, and thereby obviating any dissection of the sac. The anchoring of the testicle in its new bed is effected by suture of the sac just below the purse-string suture. The sutures to be of silk, to avoid early absorption and unfolding of the sac, and the opening to be very small, to prevent the testicle from slipping back. The use of silk and a small opening are safeguards against recurrences peculiar to this new hydrocele operation. All authorities recognize the difficulty in treating these hernial sacs, and concede them to be responsible for subsequent recurrences.

Twenty-one cases have thus far been operated. In twelve instances sufficient time, two and one-half years, has elapsed to rule out the likelihood of a relapse.—*Beiträge zur klinischen Chirurgie*, Band xxxv, Heft 2.

GENITO-URINARY ORGANS.

I. Tuberculosis of the Male Genital Organs. By PROFESSOR DR. VON BÜNGNER. In this dissertation von Büngner brings forth additional evidence to justify his plan of high castration and evulsion of the vas deferens as the best operation for the cure of tubercular testis involving the vas deferens. Experiments conducted on the cadaver showed that it was possible to evulse four-fifths of the vas deferens. Serial sections showed the vas deferens lacerated at a healthy level, and the subsequent clinical observation demonstrated these cases to be free from recurrence. After a lapse of five and three-fourths years, of

eleven cases thus treated eight were free from recurrence, one died of miliary tuberculosis, and two were treated with iodoform glycerin injections. The necessity of (von Büngner's) high castration will impress itself upon those who admit that tuberculosis of the vas deferens is in most instances an ascending process secondary to tuberculosis of the epididymis. Whereas the earlier observers regarded tuberculosis of epididymis a resultant of descending tuberculosis, the weight of evidence of foremost pathologists, Virchow, Rokitansky, Weigert, aver that vas deferens tuberculosis is secondary to tuberculosis of the epididymis. The earlier wrong belief had its origin in post-mortems conducted on advanced cases who succumbed to their tuberculosis, the incipient cases were not studied. Von Bruns, from a study of 111 cases operated on, has no doubt thought that in the great majority of instances epididymis tuberculosis preceded disease of the vas deferens.

Von Baumgarten, furthermore, was not able to produce tuberculosis of the vas deferens when cultures of tubercle bacilli were injected into the prostatic urethra or prostate, but if injected into the testicle, tuberculosis of the vas deferens regularly followed, whence Baumgarten concludes that tubercle bacilli do not travel against the stream of the blood or lymph secretion. The author himself found tuberculosis limited in six instances to the vas deferens adjoining the epididymis, and this also was corroborated by microscopical serial sections which showed the intensity of tuberculosis diminishing as sections progressed towards the prostate. Finally, the fact that diffuse tuberculosis of the vas deferens is more common than the disseminated is also favorable to the teaching of ascending tuberculosis; and where disseminated tuberculosis existed, those nodes nearer the prostate were not in as advanced a state of degeneration, and clinically, too, there is an appreciable diminution in the size of the fusiform nodules from the testes to the prostate.

In twenty instances, five times tuberculosis of the epididymis

alone existed; four times the entire tract was affected, in six cases the testis was also diseased, and in fourteen instances the testis epididymis and vas were the seat of disease. Von Büngner does not deny the occasional occurrence of descending tuberculosis.

Acceptance of this overwhelming proof as to the mode of dissemination of tuberculosis of the vas deferens is responsible for the vogue of very high castration and evulsion. For diffuse involvement of the entire genital tract, intercanalicular injections of iodoform glycerin emulsion into the vas deferens is advised, alone or in conjunction with high castration. On the other hand, extirpation of the entire genital tract is in place. The use of intercanalicular injections are too recent to permit of conclusions.

As to castration, 75 per cent. are cured after the lapse of three years. The prevailing opinion that psychoses are incident to bilateral castration is not warranted in the light of present observations.

To still further enhance the per cent. of cures, early recognition of the disease is to be sought by a rectal examination of the prostate.—*Beiträge zur klinischen Chirurgie*, Band xxxv, Heft 1.

EXTREMITIES.

I. Congenital Dislocation of the Patella. By DR. BLENCKE (Magdeburg). The author has subjected the literature bearing on this deformity to a review and found some fifty cases credited as upward dislocation of the patella of congenital origin.

The patella being a sesamoid bone cannot undergo any upward displacement unless associated with relaxation or rupture of the ligamentum patellæ. Therefore the author would, *strictu sensu*, speak of elevation (Hochstand) of the patella under these circumstances, and limit the appellation dislocation to lateral displacements.

A study of many of the reported cases showed that disturbances attributed to this displaced patella were not tenable, since

in many other like instances no such functional disturbances were at all encountered. A study of the histories shows that in many of these instances the elevation of the patella was due to contracture of the quadriceps extensor and other muscles of the thigh as an expression of (Little's disease) spastic infantile paralysis. Outward dislocation of the patella is due to deficient development of the external condyle. There is appended a radiograph showing the elevation of the patella as an accidental find in a patient in no wise disturbed in his gait.—*Zeitschrift für Orthopædische Chirurgie*, Band x, Heft 3.

MARTIN W. WARE (New York).

REVIEWS OF BOOKS.

ATLAS AND EPITOME OF OPERATIVE SURGERY. By DR. OTTO ZUCKERKANDL, Privat-docent in the University of Vienna. Second edition. Edited by J. CHALMERS DA COSTA, M.D. Philadelphia: W. B. Saunders & Co., 1902.

To the words of commendation which we applied to the first edition of this work may be added the statement that the second edition merits all of these, and, moreover, augments its value by the addition of much new and useful material. A number of the chapters have been practically rewritten; the new operations of surgery have been introduced; and the illustrations have been increased by the addition of some sixteen colored plates and sixty-one figures in the text.

The general character of the work has not been changed. It is essentially an atlas and an epitome of the operations of surgery. The author has laid down the rules and methods of surgical procedure with the clearness that springs from definite knowledge and the emphasis that is born of conviction. He has described the steps of the usual and important operations. The verbal descriptions, though lucidly given, are still further illuminated by a large number of excellent pictures. The colored plates are of much artistic merit. Were we to criticise them, we should say that they are almost too clear. They make the structures to appear more distinctly than either the surgeon or the anatomist sees them. The vessels exposed in pictures of dissections show the former to be distended beyond their normal size, probably because of the full injection of the vessels from which the pictures were drawn. And if redness is the badge of arteries, blueness that of veins, whiteness that of nerves, then there is no confusing of these structures. The pictures illustrating intestinal

suture would lead the student to use needles and thread of too great size. In our review of the first edition we called attention to the unnecessarily large trocar and cannula pictured in suprapubic puncture of the bladder. This same heavy instrument is made to do duty in this edition.

The text begins with the description of the means employed by surgery in the division of tissues in the dissections, exposures, and removals of structures. Naturally, this is followed by the reunion of tissues, in which is treated the suturing of wounds, muscles, tendons, nerves, and bones,—all of the structures except blood-vessels. Then is taken up operations on the extremities,—ligation of vessels, amputations, exarticulations, and resections. Under the heading of operations on the head and neck are trephining, operations on the jaws and tongue, the plastic operations of the mouth and face, operations on the nerves of the head, the air passages, and vessels of the neck.

The description of the operations upon the trunk includes practically all the accepted procedures upon the thorax, abdomen, and pelvis. The author gives Kocher's method of amputation of the breast, but unfortunately does not describe the better operations practised generally by American surgeons. The operations upon the thoracic viscera are well described.

Then in succession are treated operations upon the intestine, stomach, rectum and anus, biliary apparatus, and the genito-urinary organs.

All of the descriptions are clear and terse. The translation has been well done. The book is a safe and excellent guide for the student and practitioner who wishes to refresh himself in any particular operation.

Inasmuch as most surgical operations are peculiar and not according to rules, this is in no sense a text-book on operative surgery: it simply deals with the usual steps in the more common operations.

JAMES P. WARBASSE.

A TEXT-BOOK OF SURGICAL PRINCIPLES AND DISEASES OF THE FACE, MOUTH, AND JAWS. For Dental Students. By H. HORACE GRANT, A.M., M.D. Philadelphia and London: W. B. Saunders & Co., 1902.

This little work is not designed as an exhaustive treatise on surgical affections of the mouth, face, and jaws, but is simply intended to make the student of dentistry familiar in a general way with those conditions with which from time to time he may be confronted for purposes of diagnosis. Many facts are clearly and concisely stated. The several varieties of inflammation, ulceration, and tumor formation are in turn considered, and there are good chapters on tuberculosis, syphilis, and malignant disease of the face and cavity of the mouth. Perhaps more space might have been given with advantage to such conditions as fracture and necrosis of the lower jaw. The book is well illustrated, the text is clear, and on the whole it serves well for the purpose for which it is intended.

WALTER A. SHERWOOD.

ATLAS AND EPITOME OF TRAUMATIC FRACTURES AND DISLOCATIONS. By PROFESSOR DR. H. HELFERICH. Edited with additions by JOSEPH C. BLOODGOOD, M.D. Philadelphia: W. B. Saunders & Co., 1902.

This book has gone through five editions in the original, at least two in French, and now Saunders gives it to us in English very well done by Bloodgood, who has added editorial notes in the text.

The chapter on general consideration of fractures covers the ground completely, but with commendable brevity.

Beginning with the skull, fractures and dislocations are considered as they occur in each region. The more common injuries are described at length, while the rare ones are described briefly. The colored illustrations are very good. Accompanying each illustration is a full description, emphasizing the points which

the author wishes to make, and greatly enhancing the value of the plate. The plates are prepared in many instances from injuries artificially produced on the cadaver. The simplicity and directness in the illustrations and text will be of the greatest assistance to the student.

Perhaps nothing in the book is better done than the descriptions and illustrations of the subcoracoid dislocation of the humerus. Each point of diagnosis is well illustrated. The four plates in illustration of Kocher's method of reduction convey to the mind at once the technique of the operation and the reason for it. We have used the plates in this volume for teaching students with the greatest satisfaction.

It is a pleasure to have a good surgical work in size convenient to handle.

WILLIAM B. BRINSMADE.

THE TREATMENT OF FRACTURES. By CHARLES LOCKE SCUDDER, M.D. Third edition. Philadelphia: W. B. Saunders & Co., 1902.

We are pleased to see Scudder's treatment of fractures so popular as to require three editions in three years.

This book has been reviewed in detail in its earlier edition. It has met with commendation on all sides. The chapter on fractures of the bones of the face again appeals to us. It covers the ground more fully than any work with which we are familiar. The treatment of fractures of the lower jaw by the use of the severed moulded splint is particularly good.

Several new plates of fractures of the spine, cut in sagittal section, give an excellent idea of the complicating deformity and injury to the cord.

The pages on Colles's fracture and fracture of the hip are unchanged, because they need no change. We cannot too strongly recommend for study the chapter on anatomical facts regarding the epiphyses to every practitioner who attempts to treat fractures in children.

The chapter on gunshot fractures of bone is taken from the experiences of those military surgeons who have had opportunity for the treatment of these injuries. The conclusion is that, with the modern bullet and smokeless powder, the principles underlying the treatment of closed fractures are to be followed in the case of gunshot fractures.

Dr. Codman's chapter on the Röntgen ray and its relation to fractures bring us up to date on this subject.

The additional illustrations of the employment of plaster of Paris add to the value of that chapter.

WILLIAM B. BRINSMADE.

WORK BOOK IN SURGERY. By LUZERNE COVILLE. Ithaca, New York, 1902.

Dr. Coville, in his capacity as lecturer on surgery in Cornell University, has learned to appreciate the needs of the medical student, and the little book which he presents has been inspired by his knowledge of their wants.

The work is a surgical primer, giving a sufficient amount of detail so that the student may grasp the general principles of the subject. The chapters come under the heading of surgical pathology, inflammations, surgical diseases, injuries and diseases of soft parts, injuries and diseases of bone, diseases and injuries of joints, tumors, surgical operations, and surgical dressings.

We commend particularly to the practitioner as well as the student the author's excellent chapter on surgical diagnosis. The principles and precepts here laid down represent the best that the teacher can offer. The closing sentence is here reproduced: "Work for good results always. Make the diagnosis what it is, even at the expense of the patient's wishes or preclusions or his presumptions. And in expressing the diagnosis to him or to his family, and through it the prognosis of his condition, the surgeon should be candid and direct, and yet kind." We commend this to the student.

JAMES P. WARBASSE.